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FINAL

TREATABILITY STUDY IN SUPPORT OF INTRINSIC REMEDIATION FOR PUMPHOUSE 75 (SITE 57)

at

MACDILL AIR FORCE BASE TAMPA, FLORIDA

January 1997

Prepared for:

AIR FORCE CENTER FOR ENVIRONMENTAL EXCELLENCE
TECHNOLOGY TRANSFER DIVISION
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EXECUTIVE SUMMARY

This report presents the results of an intrinsic remediation treatability study (TS) performed by Parsons Engineering Science, Inc. (Parsons ES) at Pumphouse 75, MacDill Air Force Base (AFB, the Base), Tampa, Florida to evaluate the use of intrinsic remediation (natural attenuation) with long-term monitoring (LTM) as a remedial option for dissolved benzene, toluene, ethylbenzene, and xylenes (BTEX) contamination in the shallow saturated zone. Soil and groundwater contamination is documented for the site, with contamination being present in the aqueous (i.e., dissolved) and gaseous phases and as residual light nonaqueous-phase liquid (LNAPL) within the aquifer matrix. There is no evidence of mobile LNAPL (free product) at this site. This study focused on the impact of dissolved BTEX on the shallow groundwater system at and downgradient from the site. Site history and the results of soil, groundwater, and surface water investigations conducted previously also are summarized in this report.

Comparison of BTEX, electron acceptor, and biodegradation byproduct isopleth maps for groundwater at Pumphouse 75 provides strong qualitative evidence of biodegradation of BTEX compounds. Geochemical data strongly suggest that biodegradation of fuel hydrocarbons is occurring at the site, primarily via the anaerobic processes of sulfate reduction and methanogenesis.

An important component of this study was an assessment of the potential for contamination in groundwater to migrate from the source area to potential receptors at concentrations above regulatory levels intended to be protective of human health and the environment. The Bioplume II model was used to estimate the rate and direction of dissolved BTEX movement through the shallow saturated zone under the influence of advection, dispersion, sorption, and biodegradation. Input parameters for the Bioplume II model were obtained from existing site characterization data, supplemented with data collected by Parsons ES. Model parameters that were not measured at the site were estimated using reasonable literature values.

The results of this study suggest that dissolved BTEX contamination present in groundwater poses no significant threat to human health or the environment in its present, or predicted future, concentrations and distribution. However, dissolved BTEX concentrations in excess of state groundwater quality guidelines for no further action may persist in the vicinity of the site for approximately 14 years (calendar year 2009) without the implementation of an engineered remedial action. If a source removal technology such as in situ bioventing is implemented, then dissolved BTEX concentrations may decrease below no-further-action guidelines after 8 years. It is the Air Force's opinion that intrinsic remediation with LTM and institutional controls achieves the best combination of risk reduction and cost effectiveness, and recommends that this option be implemented for this site. However, engineered source reduction via a combination of bioventing and biosparging should be considered as a contingency in the event that land use in this area changes to commercial or residential, or if measured BTEX reductions in the groundwater are substantially slower than predicted by the Bioplume model. In addition, if a substantial length of the fuel pipelines is exposed in

the near future to detect leakage and repair damage, then consideration should be given to installing a bioventing/biosparging system in the resulting excavation.

To verify the Bioplume II model predictions, the Air Force recommends using 11 LTM wells and up to four point-of-compliance (POC) monitoring wells to monitor the long-term migration and degradation of the dissolved BTEX plume. Regular sampling and analysis of groundwater from these wells will allow the effectiveness of intrinsic remediation to be monitored, and should allow sufficient time to implement additional engineering controls to contain the plume if BTEX compounds are detected in the POC wells at levels of concern. Contaminant fate and transport model results indicate that sampling should continue on an annual basis for approximately 18 years. Along with other analyses used to verify the effectiveness of intrinsic remediation, the groundwater samples should be analyzed for BTEX compounds by US Environmental Protection Agency Method SW8020. If BTEX concentrations in groundwater from the POC wells exceed the Florida Department of Environmental Protection guidelines of 50 micrograms per liter for benzene and total BTEX, additional corrective critions may be required to remediate groundwater at the site.

SECTION 1

INTRODUCTION

This report was prepared by Parsons Engineering Science, Inc. (Parsons ES) and presents the results of a treatability study (TS) conducted to evaluate the use of intrinsic remediation for remediation of fuel-hydrocarbon-contaminated groundwater at Pumphouse 75 at MacDill Air Force Base (AFB, the Base), Tampa, Florida. Pumphouse 75 is a portion of Site 57, which includes the north and south apron taxiways and associated pumphouses, fueling pits, and defueling pits. Previous investigations determined that fuel hydrocarbons had been released into the soil and shallow groundwater at the site.

The main emphasis of the work described herein was to evaluate if naturally occurring attenuation mechanisms would be sufficient to reduce dissolved fuel-related compounds in groundwater to levels that meet state-specified groundwater protection standards. This study is not intended to be a contamination assessment report or a remedial action plan; rather, it is provided for the use of the Base and its prime environmental contractor(s) as information to be used for future decision making regarding this site.

1.1 SCOPE AND OBJECTIVES

Parsons ES was retained by the United States Air Force Center for Environmental Excellence (AFCEE) to conduct site characterization and groundwater modeling to evaluate if intrinsic remediation with long-term monitoring would be a scientifically defensible remedial option for contaminated groundwater at Pumphouse 75.

As used throughout this report, the term "intrinsic remediation" refers to a management strategy that relies on natural attenuation mechanisms to control exposure of potential receptors to concentrations of contaminants in the subsurface that exceed regulatory levels intended to be protective of human health and the environment. "Natural attenuation" refers to the actual processes (e.g., sorption, dispersion, and biodegradation) that facilitate intrinsic remediation.

The intent of the intrinsic remediation demonstration program sponsored by AFCEE is to develop a systematic process for scientifically investigating and documenting naturally occurring subsurface attenuation processes that can be factored into overall site remediation plans. The objective of the program and this specific MacDill AFB study is to provide substantive evidence of intrinsic remediation of dissolved fuel hydrocarbons in groundwater so that this information can be used by the Base and its prime environmental contractor(s) to develop an effective groundwater remediation strategy. As a result, these studies are not necessarily intended to fulfill specific

1-1

federal or state requirements regarding site assessments, remedial action plans, or other such mandated investigations and reports. A secondary goal of this multi-site initiative is to provide a database from multiple sites that demonstrates that natural processes of contaminant degradation often can reduce contaminant concentrations in groundwater to below acceptable cleanup standards before potential receptor exposure pathways are completed.

The scope of work for this project involved the following tasks:

- Reviewing existing hydrogeologic and soil and groundwater quality data for the site;
- Conducting supplemental site characterization activities to determine the nature and extent of soil and groundwater contamination and to collect geochemical data in support of intrinsic remediation;
- Developing a conceptual hydrogeologic model of the shallow saturated zone, including the current distribution of contaminants;
- Determining if naturally occurring processes of contaminant attenuation and destruction are occurring in groundwater at the site;
- Simulating the fate and transport of fuel hydrocarbons [benzene, toluene, ethylbenzene, and xylenes (BTEX)] in groundwater under the influence of advection, dispersion, adsorption, and biodegradation using the Bioplume II model:
- Evaluating a range of model input parameters to determine the sensitivity of the model to those parameters and to consider several contaminant fate and transport scenarios;
- Determining if naturally occurring processes are sufficient to minimize BTEX plume expansion so that groundwater quality standards can be met at a downgradient point of compliance (POC);
- Developing remedial action objectives (RAOs) and reviewing available remedial technologies;
- Using the results of modeling to recommend the most appropriate remedial option based on specific effectiveness, implementability, and cost criteria; and
- Providing a long-term monitoring (LTM) plan that includes LTM and POC well locations and a sampling and analysis plan.

Much of the hydrogeologic and groundwater chemical data necessary to evaluate the various remedial options were available from previous investigations conducted at this site or at other sites with similar characteristics, or in the technical literature. The field work conducted under this program was oriented toward the collection of supplementary hydrogeologic and chemical data necessary to document and model the

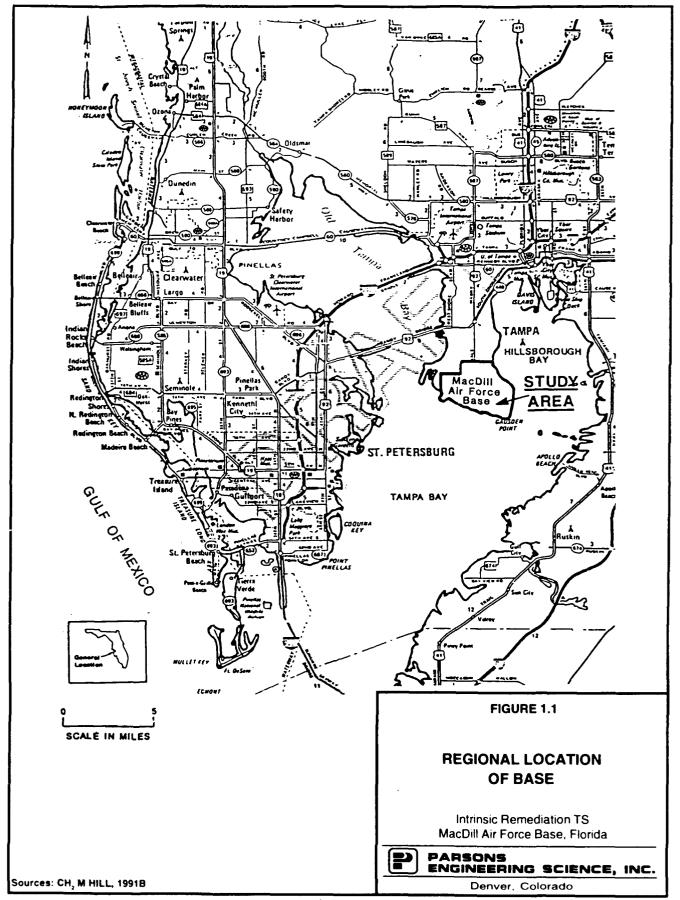
effectiveness of intrinsic remediation with long-term monitoring for fuel-hydrocarbon-contaminated groundwater. Site characterization activities in support of intrinsic remediation, performed in March and April 1995, included use of the Geoprobe® system for soil sample collection and monitoring point installation; aquifer testing; and sampling and analysis of groundwater from newly installed monitoring points and existing monitoring wells.

Site-specific data were used to develop a contaminant fate and transport model for the site using the groundwater flow and solute transport model Bioplume II, and to conduct a preliminary exposure pathways analysis. The Bioplume II model was used to simulate the movement of dissolved BTEX in the shallow saturated zone under the influence of advection, dispersion, sorption, and biodegradation. Model results were used to help assess the potential for completion of exposure pathways involving groundwater and to identify whether intrinsic remediation with LTM is an appropriate and defensible remedial option for contaminated groundwater.

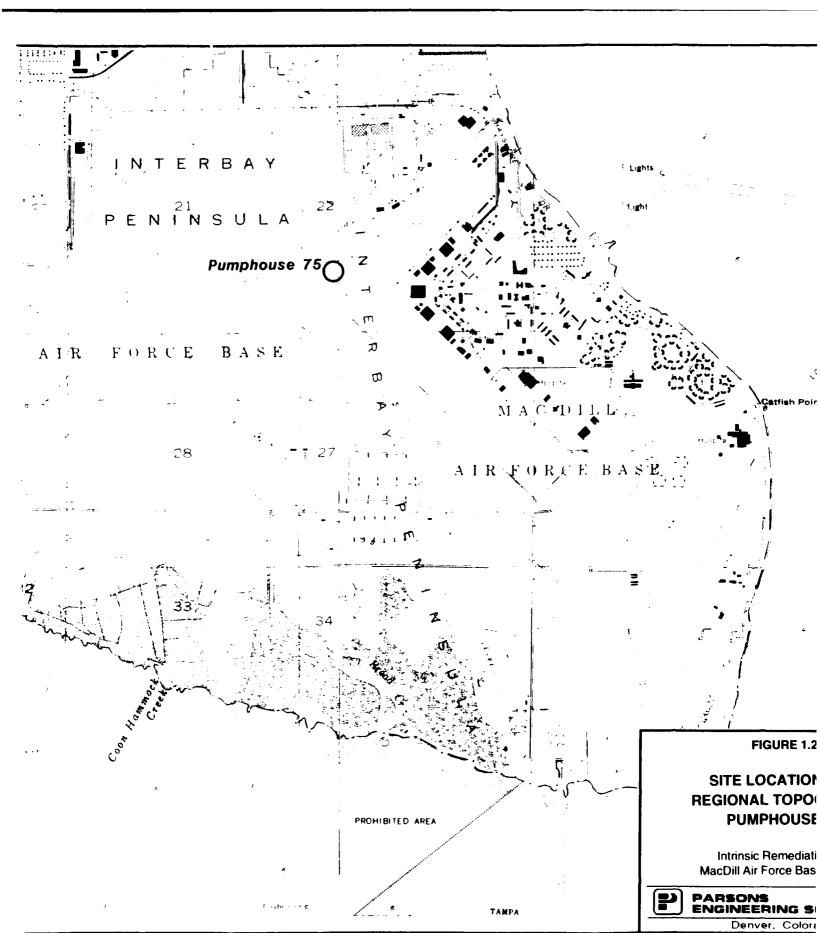
This report contains nine sections, including this introduction, and six appendices. Section 2 summarizes site characterization activities. Section 3 summarizes the physical characteristics of the study area. Section 4 describes the nature and extent of soil and groundwater contamination and the geochemistry of soil and groundwater at the site. Section 5 describes the Bioplume II model and design of the conceptual model for the site, lists model assumptions and input parameters, and describes sensitivity analyses, model output, and the results of the Bioplume II modeling. Section 6 presents a limited comparative analysis of remedial alternatives. Section 7 presents the LTM plan for the site. Section 8 presents the conclusions of this work and provides recommendations for further work at the site. Section 9 lists the references used to develop this document. Appendix A contains pertinent figures and tables containing data collected during the previous site investigation [Black & Veatch Waste Science, Inc. (BVWS), 1995]. Appendix B contains Geoprobe® borehole logs, monitoring point installation, development and sampling records, slug test results, and survey data. Appendix C presents soil and groundwater analytical results. Appendix D contains calculations and model input parameters, and Appendix E contains Bioplume II model input and output in American Standard Code for Information Exchange (ASCII) format on a diskette. Appendix F contains remedial alternative design and cost calculations.

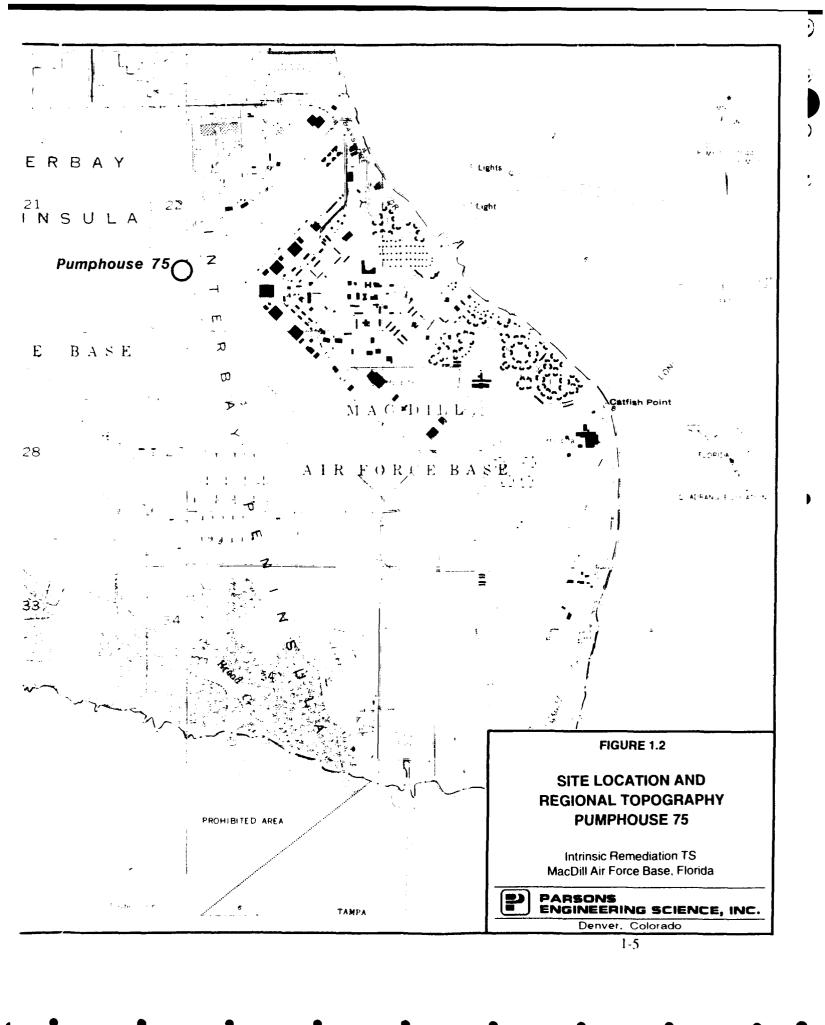
1.2 FACILITY AND SITE BACKGROUND

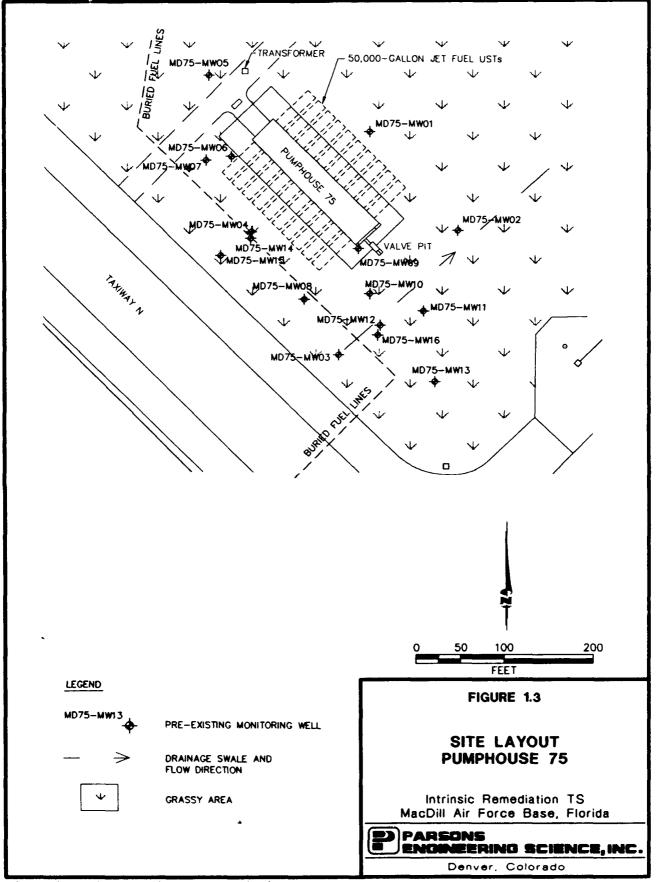
The Base, located on the southernmost tip of the Interbay Peninsula, covers nearly 7,000 acres in Hillsborough County, Florida, immediately south of the city of Tampa (Figure 1.1). The Base, which was established in the early 1950s, is bordered on the north by Tampa, on the east by Hillsborough Bay, and on the south and west by Tampa Bay. Pumphouse 75 is located in the northeastern section of the Base adjacent to Taxiway N (Figure 1.2). Contamination at Pumphouse 75 originated as fuel released from underground storage tanks (USTs) and/or underground fuel pipelines beneath and adjacent to the pumphouse (Figure 1.3).



Port Tampa INTERBA PENINSUL Pumpho MACDILL AIR FORCE BASPROHIBITED AREA Source: USGS, 1986, 1987







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At Pumphouse 75, twenty 50,000-gallon USTs are used to store jet fuel for refueling aircraft along the north apron of the flightline (Figure 1.3). In the early 1980s, aviation gasoline (AVGAS) and JP-4 fuel were stored in the tanks. No leaks or major spills from these tanks have been reported. However, minor leakage from fuel lines and buried tanks has been suspected [Engineering Science & Technology, Inc. (EA), 1991]. In the past, it was standard practice to collect 1 quart of fuel from each UST on a daily basis and visually inspect it for water content. Afterward, the fuel was poured directly onto the ground (Radian, 1991). Currently, JP-8 is used and stored at Pumphouse 75 and associated fuel pits (BVWS, 1995). The twenty USTs are presumed to lie perpendicular to the pumphouse, as shown in Figure 1.3, and are considered a potential source of petroleum contamination. However, the tanks have reportedly recently passed tightness tests, suggesting that the adjacent fuel supply pipelines are the primary contamination source. Testing of the adjacent fuel supply pipelines is currently scheduled for early 1996.

Two 6-inch-diameter jet fuel pipelines are located west and southwest of the pumphouse building. Previous contaminant assessments have identified the pipelines as sources of environmental contamination. As described in Section 4 of this report, groundwater quality data indicate that the pipelines are the primary source of dissolved BTEX contamination in the groundwater at this site.

BVWS (1995) performed two field investigations at Pumphouse 75 from September 1993 through November 1994. During the initial investigation conducted in 1993 and early 1994, five monitoring wells were installed to characterize the groundwater beneath the site. In addition, 10 Hydrocone[®], 2 piezocone, and 237 organic vapor analyzer (OVA) soil headspace samples were obtained. The headspace samples were obtained to delineate the areal and vertical extent of soil contamination at the pumphouse. The 10 Hydrocone® groundwater samples were collected at Pumphouse 75 in September 1993 to delineate the areal and vertical extent of the suspected dissolved contaminant plume. Samples were screened for fuel components (BTEX) and volatile halocarbons using a portable gas chromatograph. The five monitoring wells (MD75-MW01 through -MW05) were installed on November 4 and 5, 1993, and sampled during January 1994. After completion of groundwater sampling activities, slug tests were performed in the wells to allow estimation of the hydraulic conductivity of the screened intervals. During the installation of monitoring wells, soil samples were collected from each borehole for geotechnical classification and chemical analysis. Three sediment samples were also collected in the shallow drainage swale on the southeast side of the pumphouse (Figure 1.3).

Analytical results from the initial investigation indicated data gaps. These gaps were addressed during a second field investigation effort occurring from June to November 1994. Twenty-four additional groundwater samples were collected via Hydrocone® during June, August, and September 1994. In July and October 1994, BVWS installed an additional 11 monitoring wells (MD75-MW06 through -MW16) and collected groundwater samples in an attempt to more accurately delineate groundwater contamination in the surficial aquifer. Following their installation, slug tests were performed in the additional 11 monitoring wells to further delineate lateral and vertical variations in hydraulic conductivity within the surficial aquifer. Soil samples for OVA

headspace screening also were collected from 33 hand-augered soil boreholes and from the 11 monitoring well boreholes.

The results of the BVWS (1995) investigations at Pumphouse 75 are summarized in the *Draft Contamination Assessment Report*. Selected tables and figures from this report are contained in Appendix A of this document. Soil and groundwater beneath Pumphouse 75 were determined to be contaminated with fuel-related constituents in the vicinity of the USTs and the jet fuel pipelines. The maximum total BTEX concentrations detected in soil and groundwater were 90,100JH micrograms per kilogram (µg/kg) and 1,071 micrograms per liter (µg/L), respectively (Appendix A). The qualifier "JH" indicates that the estimated result may be biased high based on high surrogate recovery. Relatively low levels of volatile aromatic hydrocarbons were also detected in sediment samples collected in the shallow drainage swale (Appendix A). The site-specific data presented in Sections 3, 4, and 5 are based on a review of the BVWS (1995) document and on data collected by Parsons ES under this program.

SECTION 2

SITE CHARACTERIZATION ACTIVITIES

This section presents the methods used by Parsons ES personnel to collect site-specific data at Pumphouse 75, MacDill AFB, Florida. To meet the requirements of the intrinsic remediation demonstration, additional data were required to evaluate near-surface geology and geochemistry, aquifer properties, and the extent of soil and groundwater contamination. Site characterization activities involved using the Geoprobe® system for soil sampling and groundwater monitoring point placement. Groundwater sampling was accomplished during this investigation using both newly installed monitoring points and pre-existing monitoring wells. The term "monitoring point" is used in this report to distinguish these groundwater monitoring stations from conventionally-constructed monitoring wells. One aquifer slug test was conducted at a previously installed well (MD75-MW13).

The physical and chemical data listed below were collected during the field work phase of the TS:

- Depth from measurement datum to the water table in monitoring wells and monitoring points;
- · Stratigraphy of subsurface media;
- Hydraulic conductivity as determined from slug test data (slug tests measure the rate of change of groundwater elevation in a well in response to the rapid change in water level induced by the introduction or removal of a slug);
- Groundwater geochemical data [pH, temperature, electrical conductivity, total alkalinity, reduction/oxidation (redox) potential, dissolved oxygen (DO), chloride, nitrate, nitrite, ammonia, ferrous and total iron, sulfate, sulfide, manganese, ammonia, carbon dioxide, total organic carbon (TOC), and methane];
- Concentrations of chlorinated and aromatic volatile organic compounds (VOCs), total volatile (gasoline-range) petroleum hydrocarbons (TVH), total extractable (diesel-range) petroleum hydrocarbons (TEH), and ethylene in groundwater; and
- Concentrations of aromatic VOCs, TVH, TEH, and TOC in soil.

The following sections describe the procedures that were followed when collecting site-specific data. Additional details regarding investigative activities are presented in the draft work plan (Parsons ES, 1995a).

2.1 DRILLING, SOIL SAMPLING, AND MONITORING POINT INSTALLATION

Geoprobe[®]-related field work occurred between March 11 and April 2, 1995, and consisted of drilling, soil sampling, and groundwater monitoring point installation for monitoring points 75MP-1S through 75MP-9D. These activities were performed according to the procedures described in the work plan (Parsons ES, 1995a) and in the following sections.

The Geoprobe® system is a hydraulically powered percussion/probing machine used to advance sampling tools through unconsolidated soils. This system provides for the rapid collection of soil, soil gas, and groundwater samples at shallow depths while minimizing the generation of investigation-derived waste materials. Figure 2.1 is a diagram of the Geoprobe® system.

2.1.1 Groundwater Monitoring Point Locations and Completion Intervals

Thirteen new groundwater monitoring points were installed at nine locations to assist in the characterization of the contaminant distribution and the shallow groundwater flow system at Site 57. These points are identified as 75MP-1D, 75MP-1S, 75MP-2S, 75MP-3D, 75MP-4S, 75MP-5D, 75MP-6D, 75MP-7D, 75MP-7S, 75MP-8D, 75MP-8S, 75MP-9S, and 75MP-9D. The new monitoring points were installed in the locations shown on Figure 2.2, and Table 2.1 presents completion details. Nested points (e.g., 75MP-1S and 75MP-1D) were installed adjacent to each other, with one point (designated by the suffix "S") screened across the water table, and the other point (designated by the suffix "D") screened approximately 10 feet below the bottom of the shallow point. The monitoring point locations were selected to provide the hydrogeologic and chemical data necessary for successful implementation of the Bioplume II model and to support the intrinsic remediation demonstration.

2.1.2 Groundwater Monitoring Point Drilling and Soil Sampling Procedures

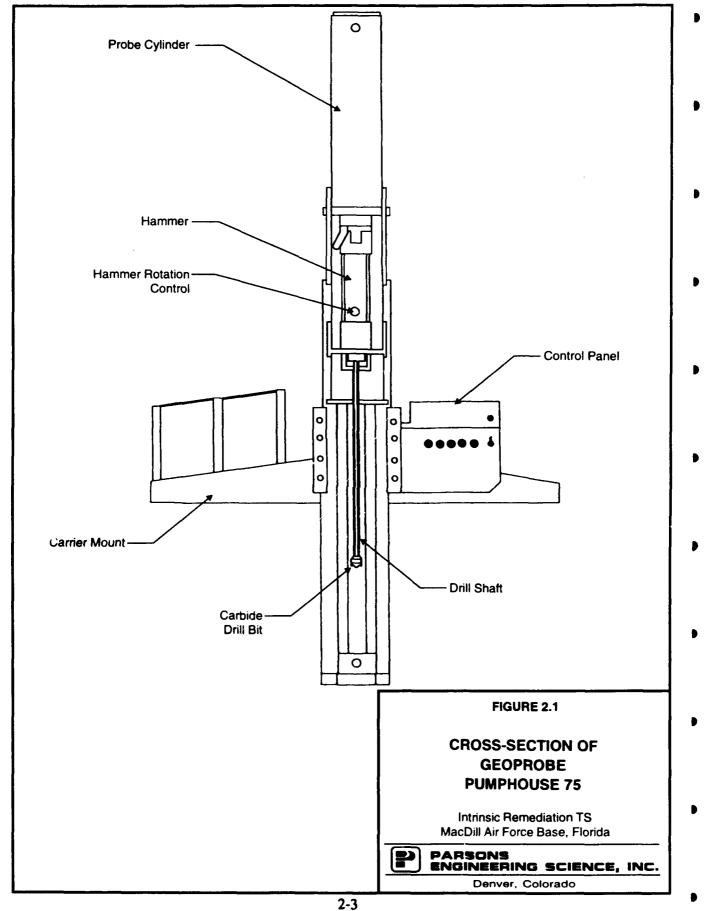
2.1.2.1 Pre-Drilling Activities

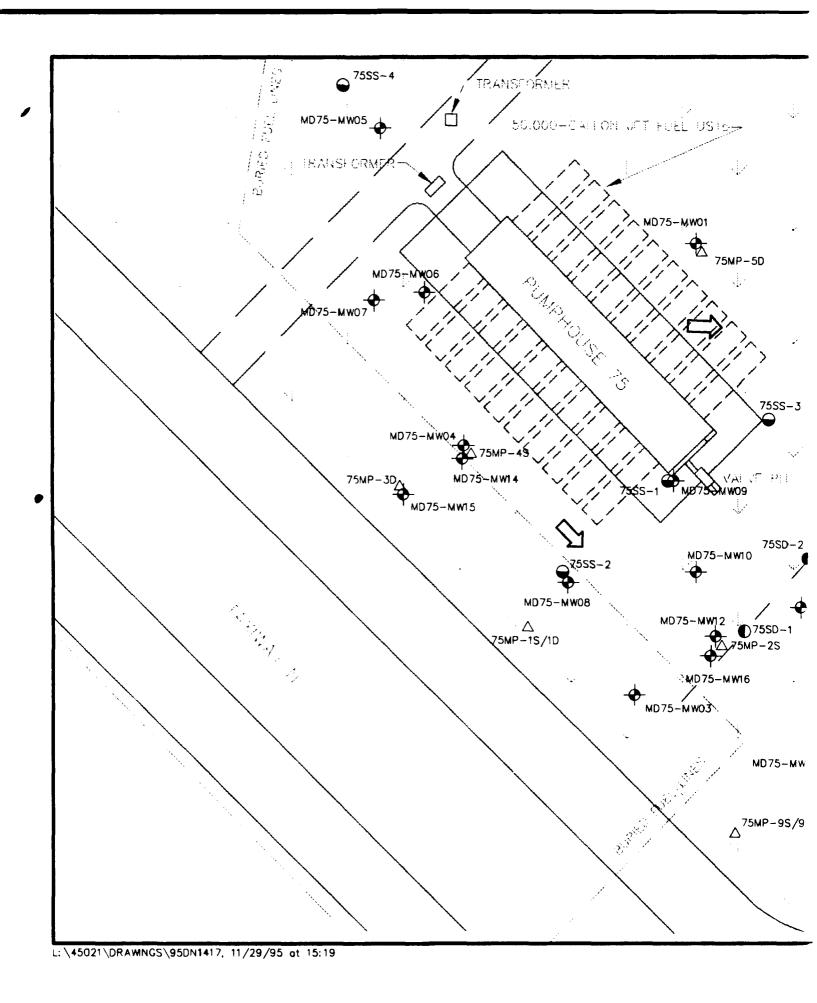
All subsurface utility lines or other man-made subsurface features were located, and proposed monitoring point and soil borehole locations were cleared and approved by the Base prior to any drilling activities. Water used in drilling, equipment cleaning, or grouting was obtained from an onsite potable water supply.

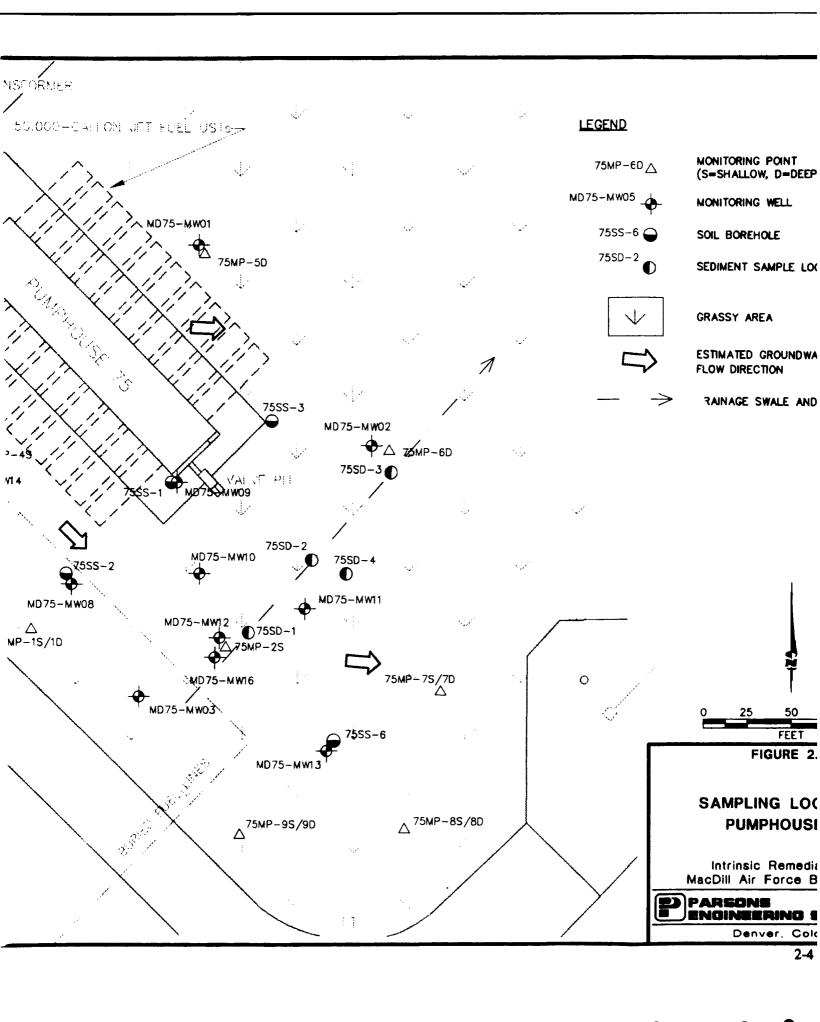
2.1.2.2 Equipment Decontamination Procedures

Prior to drilling at the site and between each drilling location, all probe rods, tips, sleeves, pushrods, samplers, tools, and other downhole equipment were decontaminated using an Alconox[®] detergent and potable water solution followed by a high-pressure potable water wash. All equipment also underwent an additional rinse with isopropyl alcohol followed by a final rinse with deionized water.

During drilling operations, the Geoprobe[®], probe rods, and any downhole drilling and/or sampling equipment were decontaminated at a site decontamination area. Water







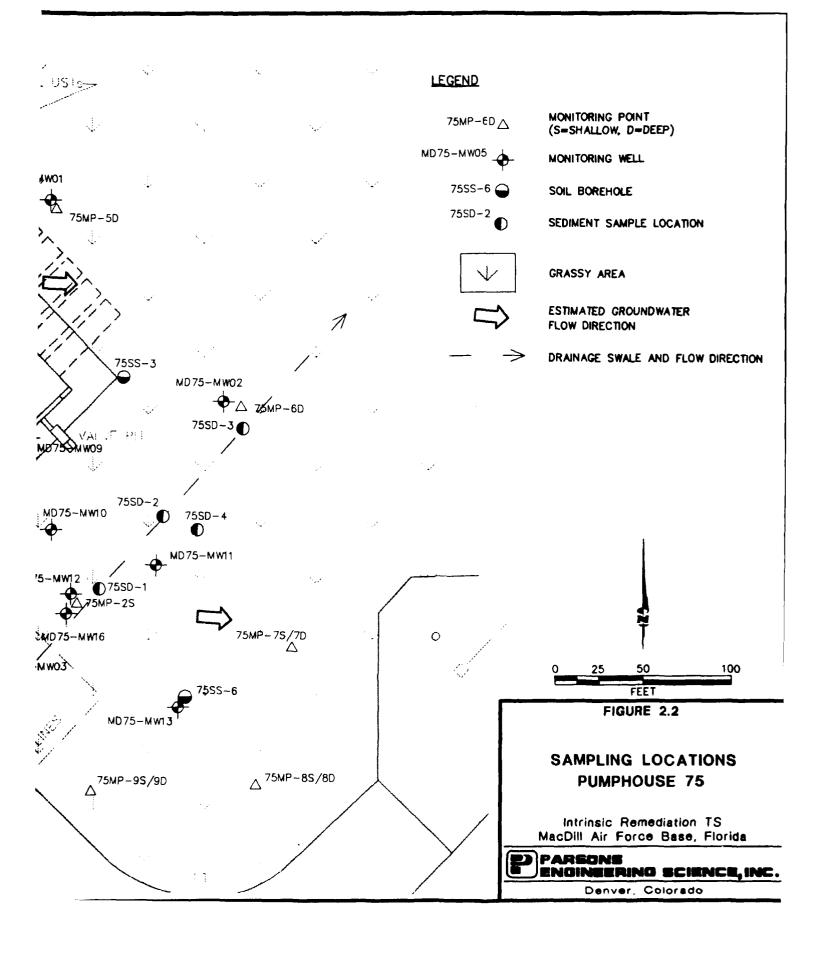


TABLE 2.1 MONITORING WELL/POINT COMPLETION DATA PUMPHOUSE 75

INTRINSIC REMEDIATION TS MACDILL AIR FORCE BASE, FLORIDA

				Well	Borehole	Total	Sandpack	Screened	Elevation	Elevation
Well/Borehole	Installation	Northing	Easting	Diameter	Diameter	Depth	Interval	Interval	toc	Ground
Identification	Date			(Inches)	(Inches)	(ft bgs) ^{a/}	(ft bgs)	(ft bgs)	(ft msl) ^b	(ft msl)
75MP-1S	3/11/95	1279726 759	494551 022	10	20	70	0 5-2 0	2 0-7 0	9011	9 165
75MP-1D	3/11/95	1279726 759	494551 022	0 375	10	20 5	NP ^o	20 0-20 5	NM ^d	9 165
75MP-2S	3/11/95	1279717 008	494661 600	10	20	7.0	0 5-2 0	2 0-7 0	8 2 1 8	8 311
75MP-3D	3/14/95	1279717 008	494476 584	0 375	10	17.5	NP	17 0-17 5	8 875	9 278
75MP-4S	3/14/95	1279823 612	494517 761	10	20	70	0.5-2.0	20-70	8 968	9 095
75MP-5D	3/14/95	1279938 459	494648 986	0 375	10	180	NP	17 5-18 0	8 821	9 085
75MP-6D	3/14/95	1279830 993	49470 434	0 375	10	20 5	NP	20 0-20 5	NM	8 375
75MP-7S	3/15/95	1279692 498	494785 180	0.575	20	7.0	NP NP	2 0-7 0	9 501	9 845
75MP-7D	3/15/95	1279692 498	494785 180	0 375	10	20 0	NP NP	19 5-20 0	NM	9 845
75MP-8S	3/15/95	1279614 809	494764 260	0.5	20	7.0	NP	2 0-7 0	9 271	9 418
75MP-8D	3/15/95	1279614 809	494764 260	0 375	10	26 0	NP NP	25 5-26 0	NM	9418
75MP-9S	3/15/95	1279611 227	494670 600	0.5	20	7.0	NP	2 0-7 0	9 355	9 651
75MP-9D	3/15/95	1279611 227	494670 600	0 375	10	20 0	NP	19 5-20 0	NM	9 651
MD75-MW01	11/4/93	1279943 109	494645 138	20	80	13 0	1 75-13 00	2 50-11 47	8 915	9 085
MD75-MW02	11/5/94	1279831 272	494745 261	20	80	14 0	1 66-14 00	2 41-11 39	8 208	8 375
MD75-MW03	11/5/93	1279689 006	494612 555	20	80	13.5	1 75-13 50	2 50-11 48	9 298	9 421
MD75-MW04	11/4/93	1279829 304	494513 990	2 0	80	13.5	1 75-13 50	2 50-11 48	9 058	9 095
MD75-MW05	11/5/93	1280007 560	494465 031	20	80	13.5	1 75-13 50	2 50-11 48	9 485	9 621
MD75-MW06	10/6/94	1279914 497	494490 557	20	80	13.5	1 25-13 5	2 0-10 98	9 125	9 181
MD75-MW07	7/21/94	1279909 652	494461 973	20	80	13.5	1 68-13 5	2 43-11 40	9 071	9 305
MD75-MW08	7/20/94	1279751 734	494574 206	20	80	13 5	1 49-13 5	2 43-11 40	9 008	9 308
MD75-MW09	10/7/94	1279809 993	494633 727	20	80	13 5	1 25-13 5	2 0-10 98	9 498	9 478
MD75-MW10	10/7/94	1279758 453	494646 775	20	80	13.5	1 25-13 5	2 0-10 98	8 921	9 135
MD75-MW11	10/9/94	1279739 086	494707 251	20	80	13.5	1 05-13 5	1 80-10 77	9 141	9 211
MD75-MW12	7/21/94	1279722 227	494658 319	20	80	13 5	1 68-13 5	2 43-11 40	8 208	8 311
MD75-MW13	10/8/94	1279658 577	494720 363	20	80	13.5	1 25-13 5	2 0-10 98	9 145	9 295
MD75-MW14	7/11/94	1279821 199	494513 126	20	80	29 0	18 94-29 0	22 86-27 18	9 068	9 095
MD75-MW15	10/6/94	1279801 398	494479 282	20	80	13.5	1 75-13 5	2 5-11 49	9 081	9 278
MD75-MW16	10/8/94	1279711 077	494655 922	20	80	28 0	17 75-28 0	20 84-25 15	8 341	8 311
75SS-1	3/13/95	1279808 500	494630 910	NA"	20	26 0	NA	NA	NA	9 480
75SS-2	3/13/95	1279756 058	494871 836	NA	20	120	NA	NA	NA	9 310
75SS-3	3/13/95	1279844 712	494687 836	NA	20	80	NA	NA	NA	9 150
75SS-4	3/14/95	1280029 260	464442 166	NA	2 0	24 0	NA	NA	NA	9 610
75SS-6	3/15/95	1279661 826	164727 737	NA	20	28 0	NA	NA	NA	9 290

a/ ft bgs = feet below ground surface

b. toc = top of casing, ft msl = feet above mean sea level

c/ NP = no sandpack

d/ NM = not measured

e/ NA = not applicable

NOTE All monitoring wells (with "MW" designation) were installed by Black & Veatch Waste Science, Inc. (1995)

from the decontamination operation was collected in 55-gallon drums and was transported to an on-Base oil/water separator for disposal. Precautions were taken to minimize any impact to the area surrounding the decontamination pad that might result from the decontamination operations. All decontamination activities were conducted in a manner so that the excess water was controlled and not allowed to flow into any open borehole.

Fuel, lubricants, and other similar substances were handled in a manner consistent with accepted safety procedures and standard operating practices. All well completion materials were factory-sealed and were not stored near or in areas that could be affected by these substances.

2.1.2.3 Borehole Installation and Soil Sampling

Borehole installation was accomplished using the Geoprobe® method. In addition to the 13 boreholes for monitoring point installation, Parsons ES installed and sampled soil boreholes 75SS-1, -2, -3, -4, and -6 (Figure 2.2). In some instances, the presence of loose, saturated sand below the water table prevented collection of soil samples. A final borehole diameter of 2 inches was used for the installation of shallow points. For the deep monitoring points, a final borehole diameter of 1 inch was used.

Soil samples were obtained using a 4-foot by 1.5-inch-inside-diameter (ID) and a 2-foot by 1-1/16-inch-ID sampling device. The large sampler was used for the initial 4 feet of soil. The smaller sampler was then advanced for the remainder of the borehole in an attempt to minimize the smearing of surface contamination into deeper portions of the borehole. Where possible, samples were collected continuously over the full depth of the soil borehole.

A probe-drive sampler serves as both the driving point and the sample collection device and is attached to the leading end of the probe rods. To collect a soil sample, the sampler was pushed or driven to the desired sampling depth, and the stop pin was removed, allowing the piston and drive point to retract as the sample barrel was pushed into undisturbed soil. The soil cores were retained within a clear acetate liner inside the sampling barrel. The probe rods were then retracted, bringing the sampling device to the surface. The soil sample was then extruded from the liners and transferred to analyte-appropriate jars supplied by the analytical laboratory. In addition, a portion of the soil sample was placed in an unused, sealable plastic bag for photoionization detector (PID) headspace measurements of VOCs. Soil remaining in the liner was used for lithologic and stratigraphic logging. Bags containing soil samples collected for the headspace screening procedure were quickly sealed and stored for 15 minutes at the ambient temperature. Semiquantitative measurements were made by puncturing the bag seal with the PID probe and reading the concentration of the headspace gases. The PID relates the concentration of total VOCs in the sample to an isobutylene calibration standard. The PID also was used to monitor for VOCs in the worker breathing zone.

The Parsons ES field hydrogeologist observed drilling and well installation activities and maintained a descriptive log of subsurface materials recovered. Final geologic borehole logs are presented in Appendix B. These logs contain:

• Sampled interval (top and bottom depth);

- Presence or absence of contamination based on odor, staining, and/or PID readings;
- Soil description, including color, major textural constituents, minor constituents, relative moisture content, plasticity of fines, cohesiveness, grain size, structure or stratification, and any other significant observations; and,
- Lithologic contacts, with the depth of lithologic contacts and/or significant textural changes recorded to the nearest 0.1 foot.

In almost all cases, one soil sample from the vicinity of the water table was submitted for laboratory analysis. In addition, a deeper sample was generally submitted from each borehole to assess the vertical extent of contamination.

Analyte-appropriate sample containers for the targeted analytes were provided by the subcontracted laboratory, Evergreen Analytical, Inc. of Wheat Ridge, Colorado. A sample label was firmly attached to the container side, and the following information was legibly and indelibly written on the label:

- · Sample identification,
- · Sample depth,
- · Sampling date, and
- Sample collector's initials.

After the samples were sealed and labeled, they were placed in a cooler with ice and held for overnight transport via Federal Express® to Evergreen Analytical, Inc. A summary of the chemical analyses performed for soil and groundwater samples is presented in Table 2.2. Information regarding sample containers, preservatives, and holding times is presented in Table 4.2 of the project Quality Assurance Project Plan (QAPP) (Parsons ES, 1994). Waste soils generated during drilling and sampling operations were spread on the ground surface in the vicinity of the site.

2.1.3 Monitoring Point Installation

Groundwater monitoring points were installed in 13 boreholes under this program. Detailed monitoring point installation procedures are described in the following paragraphs. Monitoring point completion diagrams are included in Appendix B.

2.1.3.1 Monitoring Point Materials Decontamination

Monitoring point completion materials were inspected by the field hydrogeologist and determined to be clean and acceptable prior to use. All monitoring point completion materials were factory sealed in plastic wrap. Pre-packaged casing, sand, bentonite, and concrete mix were used in point construction, and the bags were inspected for possible external contamination before use. Materials that could not be cleaned to the satisfaction of the field hydrogeologist were not used.

TABLE 2.2 ANALYTICAL PROTOCOL FOR GROUNDWATER AND SOIL SAMPLES PUMPHOUSE 75

INTRINSIC REMEDIATION TS MACDILL AIR FORCE BASE, FLORIDA

		ANALYTICAL
MATRIX/PARAMETER	METHOD	LABORATORY
ATER		
Total Iron	Colorimetric, HACH Method 8008	Field
Ferrous Iron (Fe+2)	Colorimetric, HACH Method 8146	Field
Ferric Iron (Fe+3)	Difference between total and ferrous iron	Field
Manganese	Colorimetric, HACH Method 8034	Field
Sulfide	Colorimetric, HACH Method 8131	Field
Sulfate	Colorimetric, HACH Method 8051	Field
Sulfate	E300 or SW9056	Evergreen ^{2/}
Nitrate	Titrimetric, HACH Method 8039 and 8192	Field
Nitrate	E300 or SW9056	Evergreen
Nitrite	Titrimetric, HACH Method 8040	Field
Nitrite	E300 or SW9056	Evergreen
Redox Potential	A2580B, direct reading meter	Field
Oxygen	Direct reading meter	Field
pH	Direct reading meter	Field
Conductivity	Direct reading meter	Field
Temperature	Direct reading meter	Field
Alkalinity (Carbonate [CO3-2] and Bicarbonate [HCO3-1])	Titrimetric, HACH Method 8221	Field
Carbon Dioxide	CHEMetrics Method 4500	Field
Chloride	HACH Model 8P	Field
Chloride	E300 or SW9056	Evergreen
AmmoniaDiss. Gas in Water	CHEMetrics Method 4500	Field
Alkalinity	310.1	Evergreen
Methane	RSKSOP175	USEPA b/
Ethene	RSKSOP175	USEPA
Total Organic Carbon	EPA 415.1	Evergreen
Aromatic Hydrocarbons (Including Trimethylbenzene and Tetramethylbenzene)	SW8020 (RSKSOP-133)	Evergreen
Total Volatile and Extractable Hydrocarbons	SW8015, modified	Evergreen
Volatile Organics	GS/MS method, SW8240	USEPA
Free Product	GS/MSD fuel identification	Evergreen
DIL/SEDIMENT		
Total Organic Carbon	SW9060, modified	Evergreen c/
Moisture	EPA 160.3	Evergreen
Aromatic Hydrocarbons	SW8020	Evergreen
Total Volatile and Extractable Hydrocarbons	SW8015, modified	Evergreen

a/ Evergreen Analytical, Inc. of Wheat Ridge, Colorado.

b/ National Risk Management Research Laboratory of Ada, Oklahoma.

c/ Subcontracted by Evergreen to Huffman Laboratories of Golden, Colorado.

2.1.3.2 Monitoring Point Casing and Screen

Shallow monitoring points were constructed of Schedule 40 polyvinyl chloride (PVC) riser pipe and screen having an ID of 0.5 or 1.0 inch. All casing and screen sections were flush-threaded; glued joints were not used. The riser pipe at each monitoring point was fitted with a PVC top cap, and a threaded PVC bottom cap was placed on the bottom of the screen. Monitoring point screens were 5 feet long and factory-slotted with 0.010-inch openings. Each shallow point was screened so that seasonal fluctuations of the water table could be measured and free-phase product, if present on the groundwater surface, could be detected.

Deep monitoring points were constructed using 0.25-inch-ID, Teflon® or Teflon®-lined polyethylene tubing threaded through the center of the Geoprobe® drive rods and attached to a 0.5-foot-long, 0.375-inch-diameter stainless steel, double-woven wire screen with a 0.037-inch slot size. The well screen was threaded into a dedicated stainless steel drive point/implant anchor that remained in place after the drive rods were removed. The tubing was fitted with a plastic top cap to prevent the entrance of water or sediment.

The field hydrogeologist verified and recorded the borehole depth, the lengths of all casing sections and tubing, and the depth to the top of all monitoring point completion materials placed in the annulus between the casing/tubing and borehole wall.

2.1.3.3 Sand Filter Pack

An attempt was made to place a graded 6-20 or 20-30 sand filter pack around the screened interval of each new monitoring point. The washed and bagged sand was distributed by Standard Sand and Silica Company. However, placement of the filter pack around the monitoring point screens was usually compromised by the collapse of the sand borehole walls below the water table. Therefore, most of the monitoring points are at least partially sand-packed with the native formation materials. However, due to the sandy nature of the native formation materials, monitoring point development and purging activities were accomplished without incident.

2.1.3.4 Annular Sealant

A filter pack seal of sodium bentonite pellets was placed above the sand pack (natural or introduced) in the monitoring points. The filter pack seal was generally placed above the water table due to the collapse of saturated formation sands into the borehole following removal of the Geoprobe® rods, and was hydrated in place with potable water. The thickness of the seal varied depending on the length of borehole remaining open following removal of the Geoprobe® rods, but generally ranged from 0.5 to 2 feet.

2.1.3.5 Flush-Mount Protective Cover

Each monitoring point was completed with an at-grade protective cover with a bolted cap. In all locations, the at-grade covers were cemented in place using concrete. All wells were completed with concrete pads that slope gently away from the protective casing to facilitate runoff during precipitation events. The space inside the protective

2-9

covers (below the top of the riser pipe or tubing) was filled with native sandy soils to allow drainage of any precipitation that might collect within the cover.

2.1.4 Monitoring Point Development

Prior to sampling, newly installed monitoring points were developed. Typically, well development removes sediment from inside the well casing and flushes fines, cuttings, and drilling fluids from the sand pack and the portion of the formation adjacent to the well screen. Use of the Geoprobe® system to place monitoring points eliminates cuttings and drilling fluids. As a result, development of monitoring points was primarily intended to minimize the amount of fine sediment that might accumulate in the casing.

Monitoring point development was accomplished using a peristaltic pump with dedicated silicon and high-density polyethylene (HDPE) tubing. The pump tubing was regularly lowered to the bottom of the shallow points so that fines were agitated and removed from the point in the development water. Development was continued until 10 casing volumes of water were removed, and the pH, temperature, and conductivity of the groundwater had stabilized. All well development waters in known or suspected areas of contamination were collected in 55-gallon steel drums and transferred to the oil/water separator located on the Base.

2.2 GROUNDWATER SAMPLING

This section describes the procedures used for collecting groundwater quality samples. In order to maintain a high degree of quality control (QC) during this sampling event, the procedures described in the site work plan (Parsons ES, 1995a) and summarized in the following sections were followed.

Groundwater sampling occurred during March and April 1995, and consisted of collecting groundwater samples from new monitoring points and existing monitoring wells. In addition to the sampling events conducted under this program, BVWS (1995) has conducted groundwater sampling at the site.

2.2.1 Groundwater Sampling Locations

Groundwater samples were collected from pre-existing wells and newly installed monitoring points by Parsons ES personnel. Thirteen new monitoring points, including four nested pairs, were installed at the nine locations shown on Figure 2.2. After completion of installation and development activities, these monitoring points were purged and sampled using a peristaltic pump with dedicated HDPE and silicon tubing. Sixteen existing monitoring wells, installed by BVWS (1995), also were sampled under this program. Existing wells that were sampled included MD75-MW01 through MD75-MW16 (Figure 2.2).

2.2.2 Preparation and Equipment Cleaning

All equipment used for sampling was assembled and properly cleaned and calibrated (if required) prior to use in the field. All portions of sampling and test equipment that contacted the sample were thoroughly cleaned before use. This equipment included the

water level probe and cable, equipment for measuring onsite groundwater chemical parameters, and other equipment that contacted the samples. The following cleaning protocol was used:

- Cleaned with potable water and phosphate-free laboratory-grade detergent;
- · Rinsed with potable water;
- · Rinsed with isopropyl alcohol;
- · Rinsed with distilled or deionized water; and
- · Air-dried prior to use.

Any deviations from these procedures were documented in the field scientist's field notebook and on the groundwater sampling form.

As required, field analytical equipment was calibrated according to the manufacturers' specifications prior to field use. This requirement applied to direct-reading meters used for onsite chemical measurements of DO, pH, redox potential, electrical conductivity, and temperature, as well as the Hach® meter used for other on-site geochemical analyses.

2.2.3 Groundwater Sampling Procedures

Special care was taken to prevent contamination of the groundwater and extracted samples through cross-contamination from improperly cleaned equipment. Water level probes and cable used to determine static water levels and total monitoring well/point depths were thoroughly cleaned before and after field use and between uses at different sampling locations according to the procedures presented in Section 2.2.2. In addition, a clean pair of new, disposable latex gloves was worn each time a different well or point was sampled.

2.2.3.1 Preparation of Location

Prior to starting the sampling procedure, the area around the well/point was cleared of foreign materials, such as brush, rocks, and debris. These procedures prevented sampling equipment from inadvertently contacting debris around the monitoring well/point. The integrity of the monitoring well/point was also inspected, and any irregularities in the visible portions of the well or point, protective cover, or concrete pad were noted.

2.2.3.2 Water Level and Total Depth Measurements

Prior to removing any water from the well or shallow monitoring point, the static water level was measured. In the shallow, 0.5-inch-diameter PVC monitoring points, an electrical water level probe was used to measure the depth to groundwater below the well datum to the nearest 0.01 foot. An oil/water interface probe capable of measuring the depth to both petroleum product (if present) and water was used in the previously installed 2-inch-diameter wells. Free-phase hydrocarbons were not detected in any of

the wells. Water levels in the newly-installed points constructed of Teflon® or Teflon®-lined HDPE tubing were not obtained because the diameter of the water level probe was larger than the diameter of the tubing. After measurement of the static water level, the water level probe was lowered to the bottom of the well/point for measurement of total depth (recorded to the nearest 0.1 foot). Based on these measurements, the volume of water to be purged from the wells/points was estimated.

2.2.3.3 Monitoring Well/Point Purging

Where possible, three times the calculated casing volume was removed from each well or point prior to sampling. Purging continued until the pH, DO concentration, redox potential, conductivity, and temperature stabilized for a 1-minute period. A peristaltic pump with dedicated silicon and HDPE tubing was used for well evacuation. Purge water from areas believed to be contaminated based on field observations and historical groundwater quality data was disposed of in the Base oil/water separator. Water presumed to be clean was discharged onto the ground surface in the vicinity of the sampling location.

2.2.3.4 Sample Collection

A peristaltic pump with dedicated silicon and HDPE tubing was used to extract groundwater samples from each well and monitoring point. Purging and sampling constituted one continuous sampling event, and there was no cessation of pumping prior to sample collection. For shallow monitoring points, the dedicated HDPE tubing was lowered down the casing to approximately the middle of the screened interval. Sampling from the deep points, constructed of tubing, was accomplished by attaching the silicon tubing directly to the top of the monitoring point tubing using a hose barb. The samples were transferred directly into the appropriate sample containers. The water was carefully poured down the inner walls of each sample bottle to minimize aeration of the sample. Sample bottles for BTEX, trimethylbenzene (TMB), tetramethylbenzene (tetraMB), TVH, methane, anions, alkalinity, halogenated VOCs, and Hach® field analyses were filled so that there was no headspace or air bubbles within the container. Table 2.2 lists the analyses performed on collected groundwater samples.

2.2.4 Onsite Chemical Parameter Measurement

2.2.4.1 Dissolved Oxygen Measurements

DO measurements were taken using an Orion® model 840 DO meter in a flow-through cell at the outlet of the peristaltic pump. DO concentrations were recorded after the readings stabilized, and in all cases represent the lowest DO concentration observed.

2.2.4.2 Electrical Conductivity, pH, Redox Potential, and Temperature Measurements

The electrical conductivity, pH, redox potential, and temperature of the groundwater were measured in the field, in the same flow-through cell used for DO measurements. The measured values were recorded on the groundwater sampling record (Appendix B).

2.2.4.3 Hach and CHEMET Field Chemistry Measurements

An onsite laboratory staffed by Parsons ES personnel was used to analyze for several indicator parameters in groundwater samples taken from pre-existing monitoring wells and newly installed monitoring points. A Hach DR/700 colorimeter was used to measure ferrous iron (Fe²⁺), total iron (Fe), nitrate (NO₃), nitrite (NO₂), sulfate (SO₄²), manganese (Mn²⁺), and sulfide (S²). Titrations using Hach[®] reagents were conducted to measure alkalinity [as milligrams per liter (mg/L) calcium carbonate (CaCO₃)] and chloride (Cl), and CHEMet color tests were used to measure ammonia (NH_3) and carbon dioxide (CO_2) . These analyses were completed for each groundwater sample after all sample containers had been filled. The sample to be analyzed was poured into a clean glass container, capped, and transported to the Parsons ES on-Base laboratory for analysis. Care was taken to avoid any headspace in the sample container which could influence the concentration of reduced species. The field holding time for each sample did not exceed 1 hour. Care was taken to minimize sample temperature changes and exposure to sunlight. Concentrations of these indicator parameters were not measured in soil samples.

2.2.5 Sample Handling

2.2.5.1 Sample Containers, Preservation, and Labels

The off-Base analytical laboratories [Evergreen Analytical, Inc. of Wheat Ridge, Colorado and the US Environmental Protection Agency (USEPA) National Risk Management Research Laboratory (NRMRL) in Ada, Oklahoma (formerly the Robert S. Kerr Environmental Research Laboratory)] provided pre-preserved sample containers when appropriate. NRMRL provided a separate preservative for methane analysis, which was added to the samples by the Parsons ES field personnel.

The sample containers were filled as described in Section 2.2.3.4, and the container lids were tightly closed. The sample label was firmly attached to the container side, and the following information was legibly and indelibly written on the label:

- Analysis to be performed;
- Facility name;
- Sample identification;
- Sample type (groundwater);
- Sampling date;
- · Sampling time;
- · Preservatives added; and
- Sample collector's initials.

2.2.5.2 Sample Shipment

After the samples were sealed and labeled, they were packaged for transport to the analytical laboratory in Wheat Ridge, Colorado or to NRMRL in Ada, Oklahoma. The following packaging and labeling procedures were followed:

- Samples were packaged to prevent leakage or vaporization from the containers;
- · Samples were cushioned to avoid breakage; and
- Ice was added to the cooler to keep the samples cool.

The packaged samples were delivered by overnight courier (Federal Express®) to the laboratory. Chain-of-custody procedures outlined in the project work plan (Parsons ES, 1995a) were followed. Laboratory samples for field analysis were hand-delivered to the on-Base Parsons ES laboratory, where they were analyzed by Parsons ES using methods and reagents developed and sold by Hach Chemical Company and CHEMetrics.

2.3 AQUIFER TESTING

A slug test was performed in well MD75-MW13 (Figure 2.2) for comparison to the previous hydraulic conductivity estimates obtained by BVWS (1995). Slug tests are single-well hydraulic tests used to estimate the hydraulic conductivity of an aquifer in the immediate vicinity of the tested well. Slug testing can be performed using either a rising head or a falling head test. Both rising head and falling head tests were used at this site. Detailed slug testing procedures are presented in the Technical Protocol for Implementing Intrinsic Remediation with Long-Term Monitoring for Natural Attenuation of Fuel Contamination Dissolved in Groundwater (Wiedemeier et al., 1995), hereafter referred to as the Technical Protocol document.

Data obtained during slug testing were analyzed using the computer program AQTESOLV® (Geraghty & Miller, Inc., 1994) and the methods of Bouwer and Rice (1976) and Bouwer (1989) for unconfined conditions. The results of slug testing are presented in Section 3.3 and Appendix B.

2.4 SURVEYING

After completion of field work, the locations and elevations of all new monitoring points and pre-existing monitoring wells were surveyed by Landmark Surveying and Engineering, Inc. of Tampa, Florida. The horizontal locations and elevations of the measurement datum (top of PVC well casing) and the ground surface adjacent to the well casing were measured relative to existing on-Base survey control points. Horizontal locations were surveyed to the nearest 0.1 foot. Measurement datum and ground surface elevations were surveyed to the nearest 0.01 foot. Survey data are presented in Table 2.1 and Appendix B.

SECTION 3

PHYSICAL CHARACTERISTICS OF THE STUDY AREA

This section incorporates data collected by Parsons ES in March and April 1995 and information contained in BVWS (1995) and CH2M Hill (1990, 1991a, and 1991b).

3.1 GROUND SURFACE TOPOGRAPHY AND SURFACE WATER HYDROLOGY

The Base is located on the western edge of Central Florida in the Southeast Coastal Plain Physiographic Province, a region characterized by slight local relief and low elevations. A topographic map of the Base area is presented in Figure 1.2. Elevations at the Base range from 0 to 12 feet above mean sea level (msl). Major surface water bodies near the Base include Tampa Bay, which borders the Base on the west and south; Hillsborough Bay, which forms the eastern border of the Base; and the Gulf of Mexico, which lies approximately 19 miles to the west (Figure 1.1). Three tidal inlets are present in mangrove swamps on the south side of the Base, including Coon Hammock Creek, Picnic Island Creek, and Broad Creek. Other surface water features include storm drains and drainage canals which traverse the Base, and small ponds and lakes. Runoff of surface water is carried by the drainage canals, which empty into Tampa Bay and Hillsborough Bay.

The ground surface in the vicinity of Pumphouse 75 is relatively flat, with elevations ranging from approximately 8 to 10 feet msl. The lowest ground surface elevations at the site occur in a broad, shallow (maximum 1 foot deep), northeast-southwest trending drainage swale located southeast of the pumphouse building that drains to the northeast. Pumphouse 75 is situated very near a surface drainage divide (see the surface drainage map in Appendix A). The majority of the site appears to drain to the southwest, toward a series of drainage ditches that discharge to Tampa Bay. The southeastern and eastern portions of the site appear to drain to the northeast, toward a drainage ditch that discharges to Hillsborough Bay.

3.2 CLIMATOLOGY

According the BVWS (1995), the average annual precipitation at the Base is 44.3 inches, with the lowest rainfall in April and the highest in August. The reported average annual evapotranspiration (ET) is 39 inches. However, ET rates will vary depending on the vegetative cover.

3.3 MANMADE FEATURES

As shown on Figure 2.2, much of the land surface at the site is paved or covered with buildings. A substantial percentage of the precipitation falling on unpaved areas

probably infiltrates into the subsurface due to the flat surface topography and sandy soils. The extent to which underground utility corridors influence groundwater movement is not known. However, significant preferential movement of contaminants along utility corridors was not indicated by the previous site characterization (BVWS, 1995). The relatively sandy nature of the soils in the saturated zone, and the resulting higher permeabilities, would tend to minimize preferential migration of contaminants along utility corridors.

3.4 REGIONAL GEOLOGY AND HYDROGEOLOGY

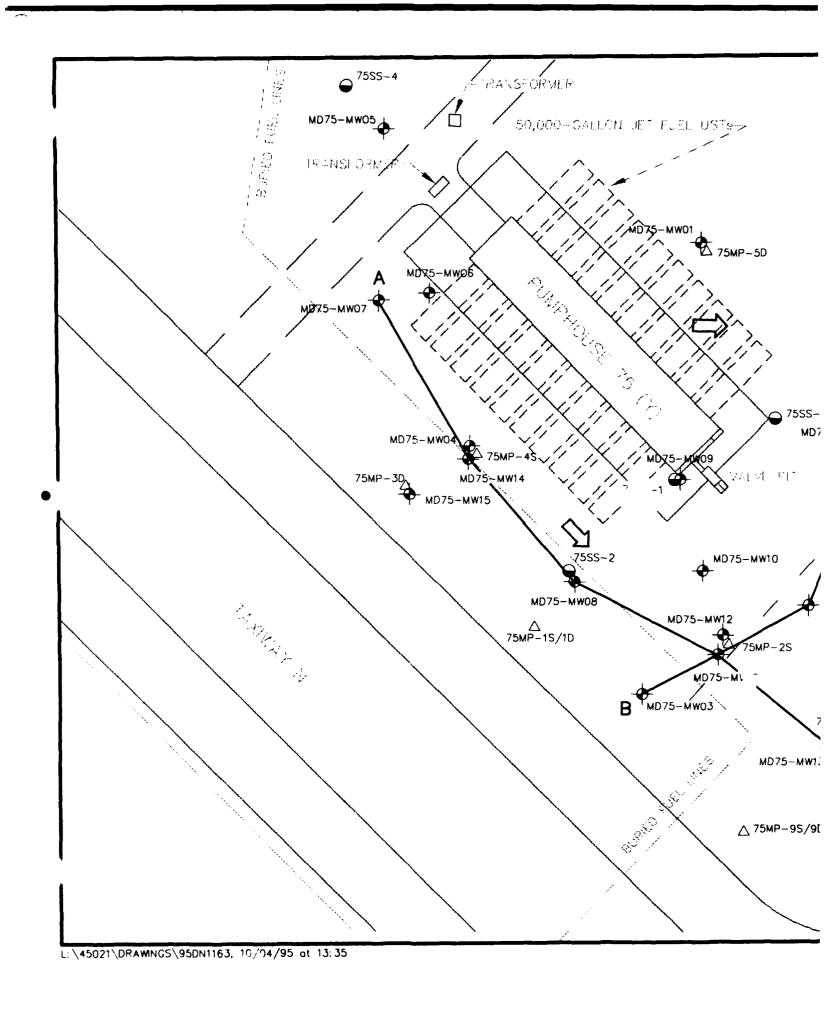
The information provided in this section is condensed from the more detailed discussions contained in BVWS (1995) and CH2M Hill (1990 and 1991a). The unconsolidated, Quaternary-age, coastal plain sediments found at the surface in the Tampa area consist predominantly of fine sand containing interbedded clay, marl, shell, limestone, and phosphorite. These sediments, which form the surficial, unconfined aquifer, range in thickness from almost zero to approximately 100 feet. The water table depth ranges from the ground surface to several feet below the ground surface (bgs).

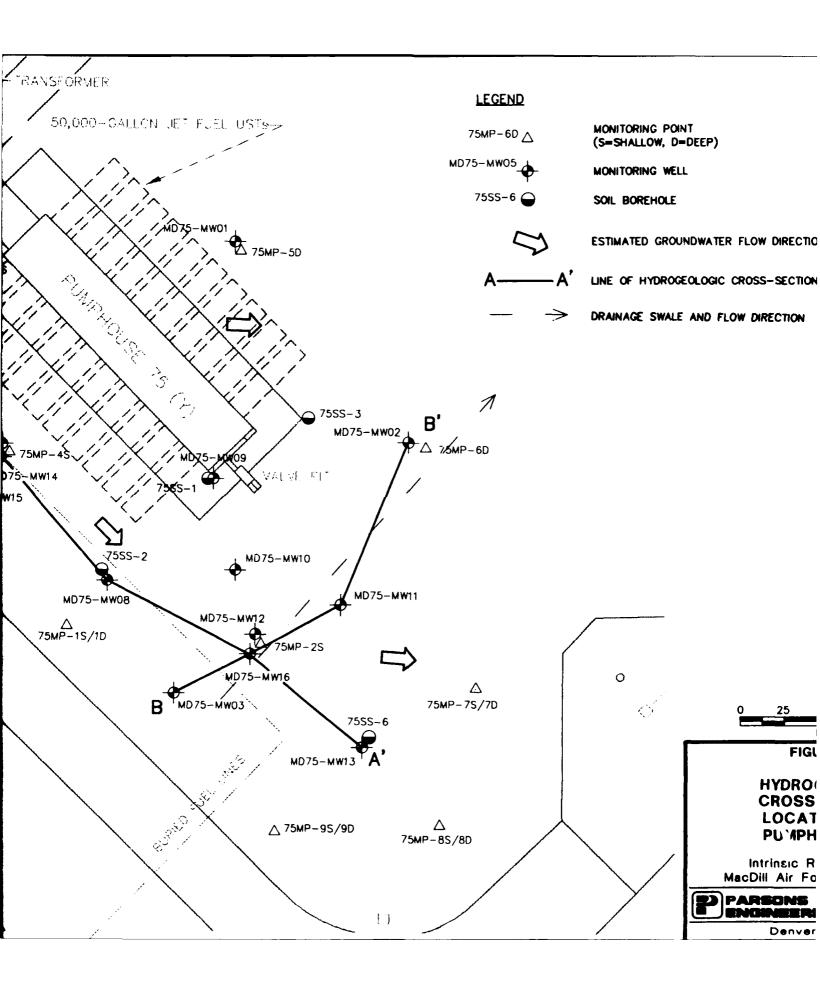
The surficial aquifer is underlain by Pliocene-age deposits consisting of phosphatic, clayey and pebbly sand, clay, marl, and shell. These deposits, which range from less than 25 feet to about 100 feet in thickness and comprise a confining layer, are underlain by carbonate and clastic sediments of the Hawthorn Formation and Tampa Limestone. The solutioned Tampa Limestone forms the uppermost confined limestone aquifer. The limestones of the Florida Aquifer, which provides water for most of Florida and the southern third of Georgia, lie beneath the Tampa Limestone aquifer.

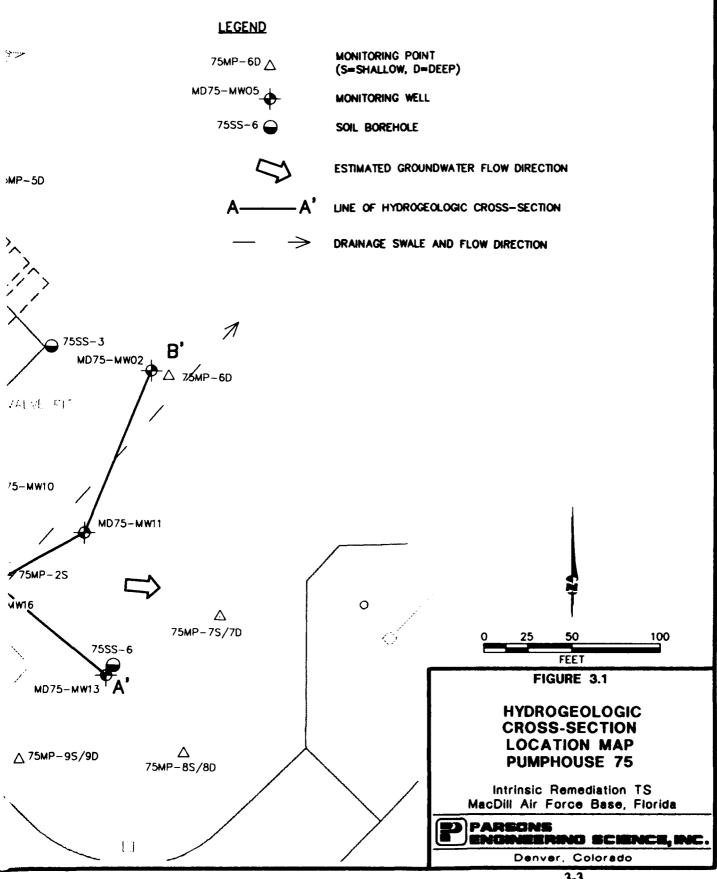
At the Base, the surficial, unconfined aquifer consists of 20- to 60-foot layers of fine quartz sand, silty sand, and clayey sand that overlie a clay unit. The Tampa Limestone occurs beneath the clay and is estimated to be approximately 100 feet thick. In some areas, the surficial and Tampa Limestone aquifers may be hydraulically connected.

3.5 SITE GEOLOGY AND HYDROGEOLOGY

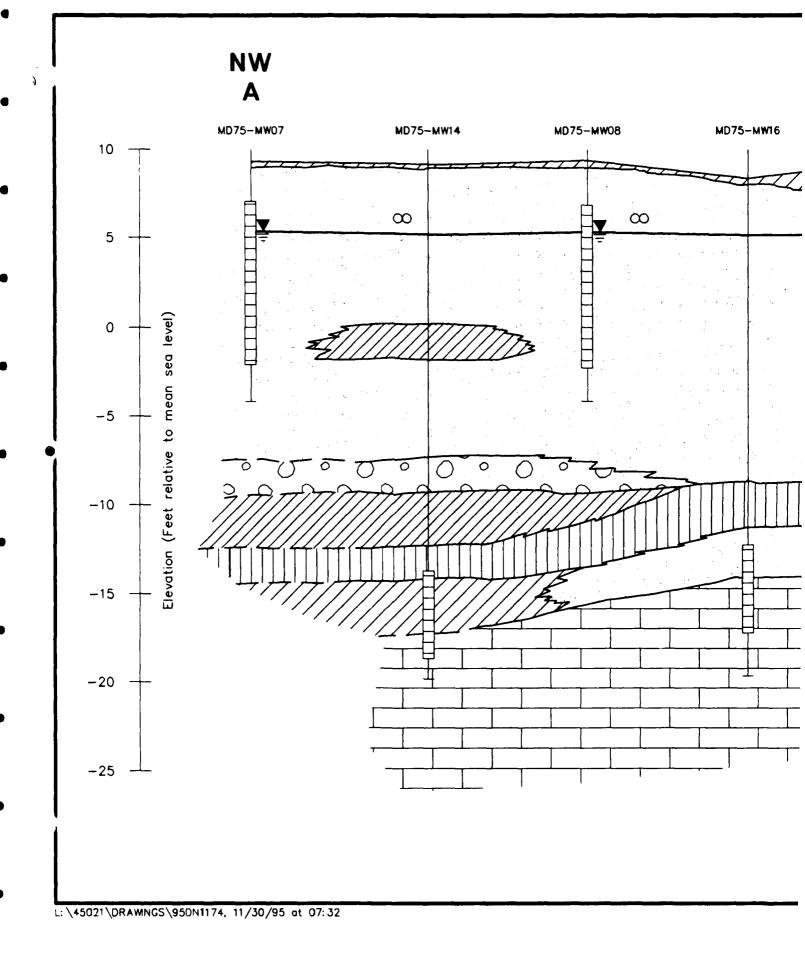
The locations of two site-specific hydrogeologic cross sections are depicted in Figure 3.1, and the sections themselves are shown in Figures 3.2 and 3.3. Sections A-A' and B-B' are oriented approximately parallel and perpendicular, respectively, to the local, southeasterly groundwater flow direction. The shallow sediments in the vicinity of Pumphouse 75 consist primarily of relatively well-sorted, fine-grained sand containing discontinuous layers of silty to clayey sand. Layers of calcareous gravel, clay, clayey sand, sand, silty sand, and clayey limestone were penetrated during the advancement of the borehole for monitoring well MD75-MW14, and clay and limestone were penetrated by the borehole for well MD75-MW16. These boreholes were advanced to depths of 29 feet and 28 feet, respectively. Clay layers were also penetrated by soil boreholes 75SS-1 and 75SS-4 at depths of 24 feet and 20 feet, respectively. Based on the available data, the thickness of the surficial sandy aquifer beneath Pumphouse 75 is estimated to be approximately 15 to 20 feet.

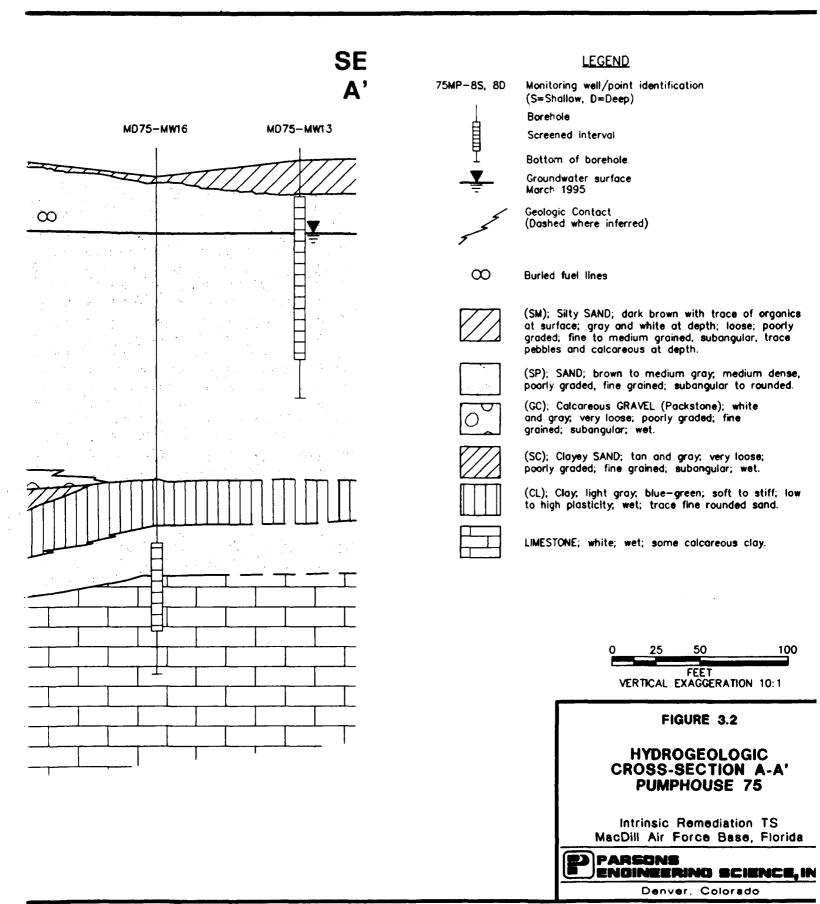


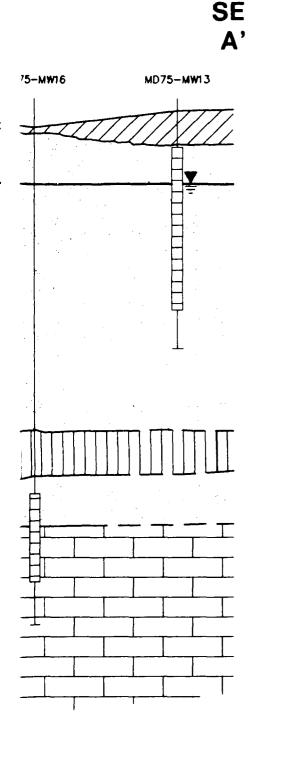




3







LEGEND

75MP-8S, 8D Monitoring well/point identification
(S=Shallow, D=Deep)

Borehole
Screened interval

Bottom of borehole
Groundwater surface
March 1995

Geologic Contact
(Dashed where inferred)

Buried fuel lines

(SM); Silty SAND; dark brown with trace of organics at surface; gray and white at depth; loose; poorly graded; fine to medium grained, subangular, trace pebbles and calcareous at depth.

(SP); SAND; brown to medium gray, medium dense, poorly graded, fine grained; subangular to rounded.

(GC): Calcareous GRAVEL (Packstone); white

(GC); Calcareous GRAVEL (Packstone); white and gray; very loose; poorly graded; fine grained; subangular; wet.

(SC); Clayey SAND; tan and gray, very loose; poorly graded; fine grained; subangular; wet.

(CL); Clay, light gray, blue—green; soft to stiff; low to high plasticity; wet; trace fine rounded sand.

LIMESTONE; white; wet; some calcareous clay.



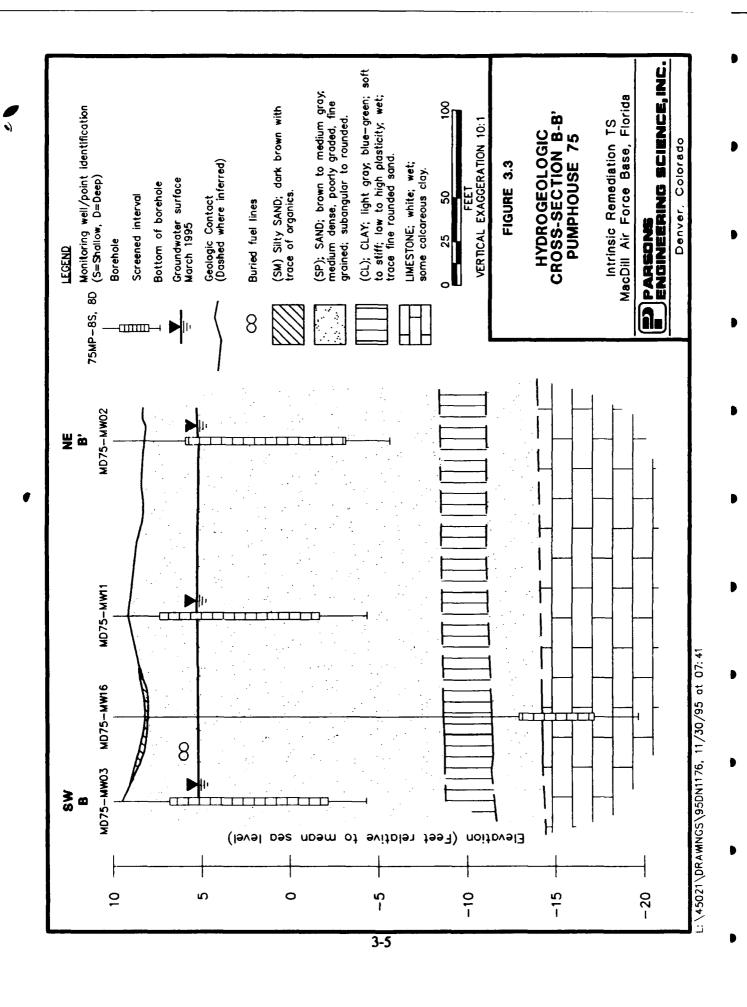
FIGURE 3.2

HYDROGEOLOGIC CROSS-SECTION A-A' PUMPHOUSE 75

Intrinsic Remediation TS
MacDill Air Force Base, Florida

PARSONS ENGINEERING SCIENCE, INC.

Denver. Colorado



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The groundwater surface beneath Pumphouse 75 is present at a depth of approximately 3 to 5 feet (Table 3.1), and groundwater migrates in an easterly to southeasterly direction (Figure 3.4). The lateral hydraulic gradient measured in March 1995 was approximately 0.0009 foot per foot (ft/ft). This measurement is similar to the lateral hydraulic gradient measured by BVWS (1995) in January 1995, which ranged from approximately 0.0007 ft/ft to 0.001 ft/ft.

Comparison of groundwater elevations in two nested well pairs (MD75-MW12/M075-MW16 and MD75-MW4/MD78-MW14) indicates that in March 1995, a vertical (downward) component to the hydraulic gradient was present. Using the head difference between the shallow and deep wells, and the distance between the midpoints of the saturated portions of their screens, the vertical hydraulic gradient was calculated to be approximately 0.007 ft/ft to 0.01 ft/ft. Downward gradients ranging from 0.004 ft/ft to 0.009 ft/ft also were present in October 1994 and January 1995, based on groundwater elevation data reported by BVWS (1995).

A total of 14 slug tests were performed by BVWS (1995) in Pumphouse 75 monitoring wells screened in the sandy surficial aquifer. The resulting hydraulic conductivity values ranged from 5.2 to 90.7 feet per day (ft/day) [1.83 x 10⁻³ to 3.20 x 10⁻² centimeters per second (cm/sec)]. The mean hydraulic conductivity of the tested wells screened at the water table was 15.6 ft/day. Slug tests also were performed in two wells screened in the silty sands and limestone underlying the surficial sands (MD75-MW14 and MD75-MW16). These tests yielded hydraulic conductivity values of 20.2 ft/day (7.1 x 10⁻³ cm/sec) and 17.7 ft/day (6.20 x 10⁻³ cm/sec), respectively. The slug test performed by Parsons ES in March 1995, resulted in a hydraulic conductivity of 55.4 ft/day (2.0 x 10⁻² cm/sec) in well MD75-MW13.

The advective velocity of groundwater in the direction parallel to groundwater flow is given by:

$$\overline{v} = \frac{K}{n_e} \frac{dH}{dL}$$

Where: v = Average advective groundwater velocity (seepage velocity) [L/T],

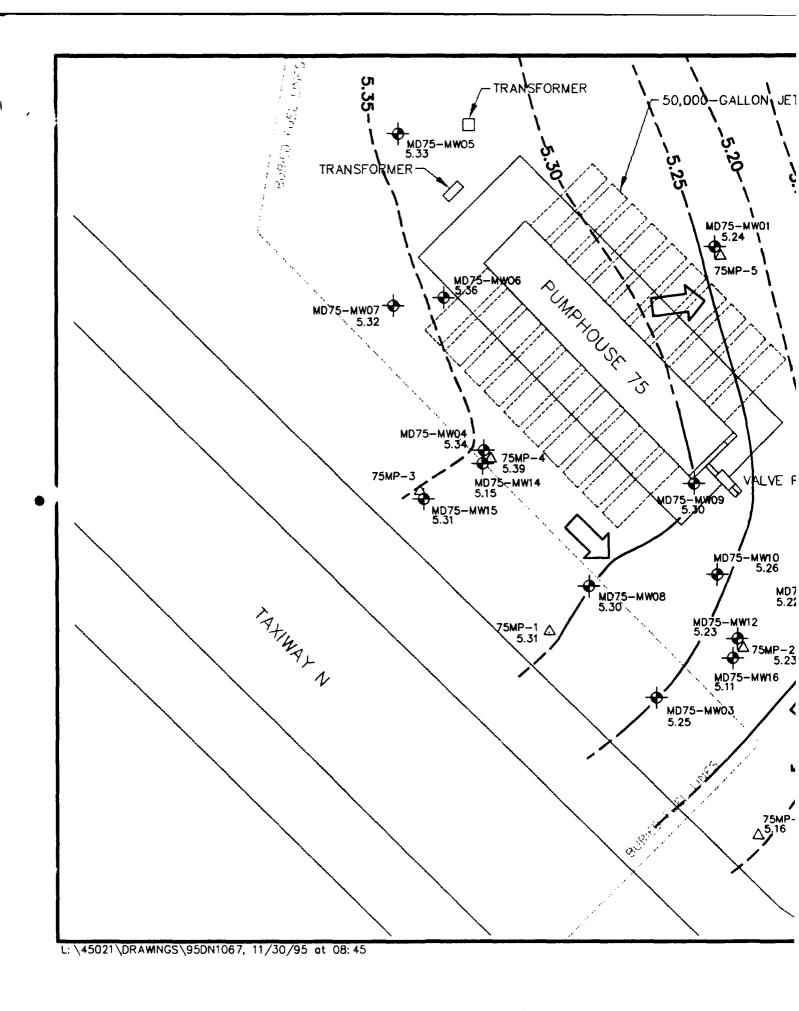
K = Hydraulic conductivity [L/T], dH/dL = Gradient [L/L], and n_e = Effective porosity.

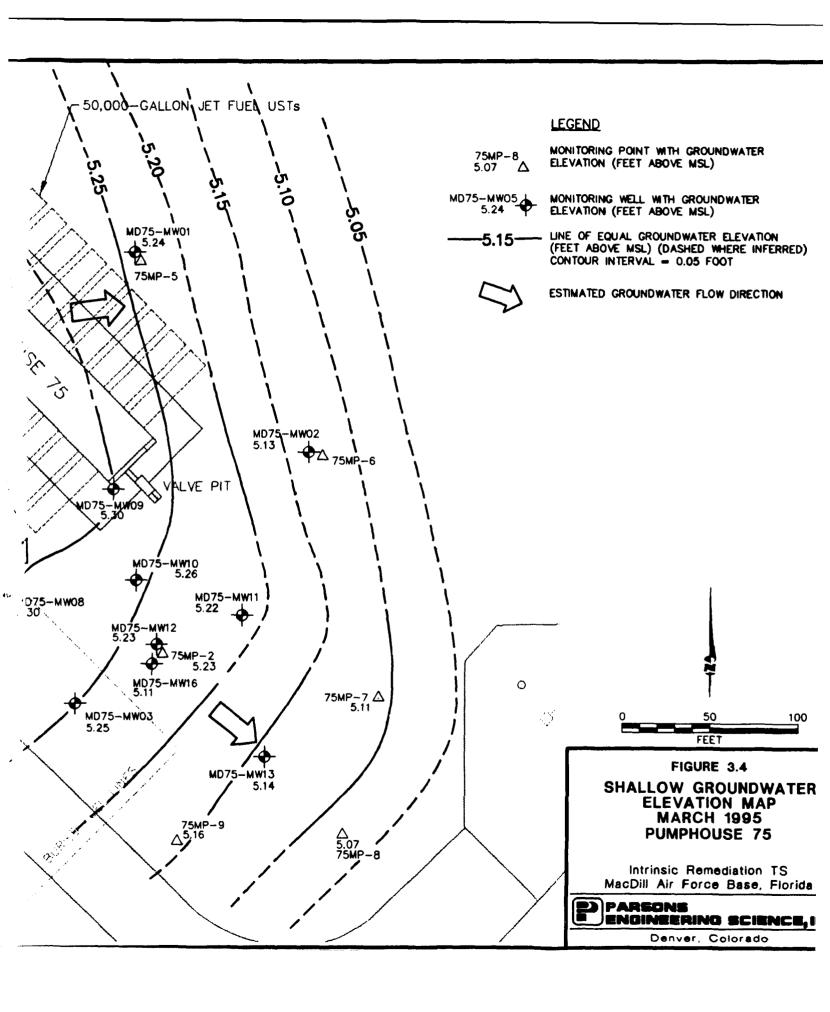
The average effective porosity of the shallow, sandy aquifer is estimated to be 0.25 on the basis of literature values contained in Johnson (1967) and Walton (1988). Using an average hydraulic conductivity of 15.6 ft/day (from BVWS slug tests), an average hydraulic gradient of 0.0009 ft/ft, and an effective porosity of 0.25, the average advective groundwater velocity within the shallow, sandy aquifer is approximately 0.06 ft/day (22 ft/year).

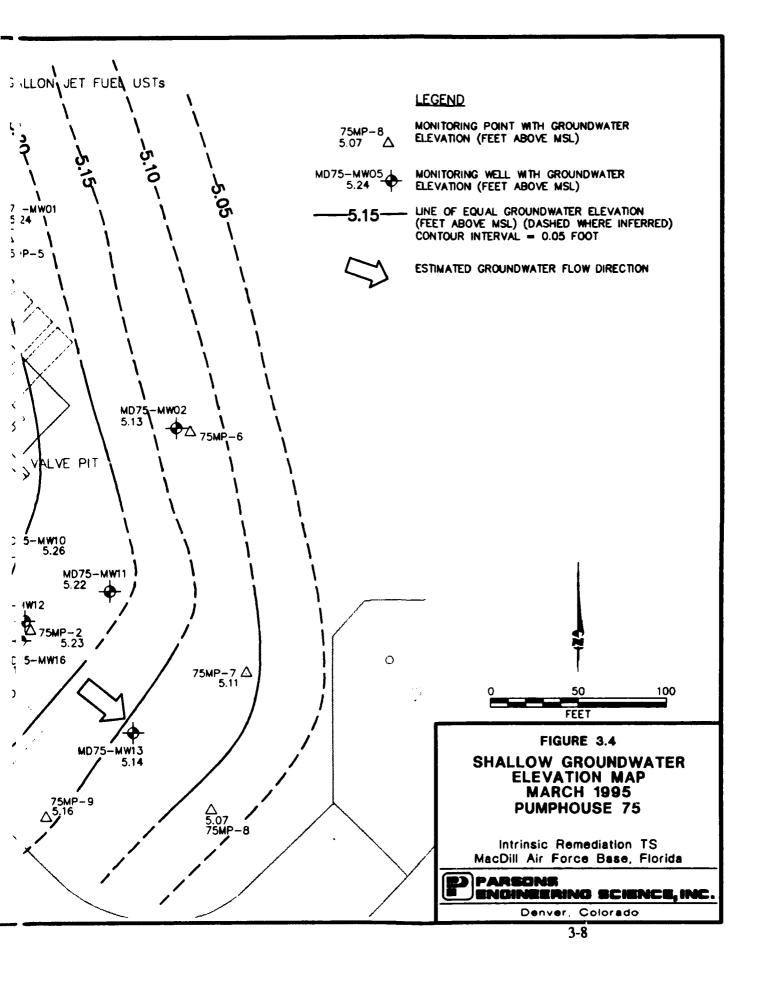
Intrinsic Remediation TS MacDill Air Force Base, Florida WATER LEVEL DATA PUMPHOUSE 75 TABLE 3.1

		_	,				_	_						_		_		_	_	_	_	_	_	
Elevation of Water Table	(ft msl)		5.31	5.23	5.39	5.11	5.07	91.5	5.24	5.13	5.25	5.34	5.33	5.36	5.32	5.30	5.30	5.26	5.22	5.23	5.14	5.15	5.31	5.11
Total Depth to Water	(ft btoc)		3.70	2.99	3.58	4.39	4.20	4.19	3.67	3.08	4.05	3.72	4.15	3.76	3.75	3.71	4.20	3.66	3.92	2.98	4.00	3.92	3.77	3.23
Total Depth to Water	(ft bgs) ^{b/}		3.85	3.08	3.71	4.73	4.35	4.49	3.84	3.25	4.17	3.76	4.29	3.82	3.98	4.01	4.18	3.87	3.99	3.08	4.15	3.95	3.97	3.20
Ground Elevation	(ft msl)		9.165	8.311	9.095	9.845	9.418	159'6	9.085	8.375	9.421	560'6	9.621	181.6	9.305	80£.6	9.478	9.135	9.211	8.311	9.295	9.095	9.278	8.311
Datum Elevation	(ft msl)*		9.011	8.218	8.968	9.501	9.271	9.355	8.915	8.208	9.298	850.6	9.485	9.125	1/0.6	800'6	864.6	8.921	9.141	8.208	9.145	890.6	9.081	8.341
Well	(inches)		1.0	1.0	1.0	0.5	0.5	0.5	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
	Easting		494551.022	494661.600	494517.761	494785.180	494764.260	494670.600	494645.138	494745.261	494612.555	494513.990	494465.031	494490.557	494461.973	494574.206	494633.727	494646.775	494707.251	494658.319	494720.363	494513.126	494479.282	494655.922
	Northing		1279726.759	1279717.008	1279823.612	1279692.498	1279614.809	1279611.227	1279943.109	1279831.272	1279689.006	1279829.304	1280007.560	1279914.497	1279909.652	1279751.734	1279809.993	1279758.453	1279739.086	1279722.227	1279658.577	1279821.199	1279801.398	1279711.077
	Date		3/27/95	3/27/95	3/27/95	3/27/95	3/27/95	3/27/95	3/27/95	3/27/95	3/27/95	3/27/95	3/27/95	3/27/95	3/27/95	3/27/95	3/27/95	3/27/95	3/27/95	3/27/95	3/27/95	3/27/95	3/27/95	3/27/95
Well	Location		75MP-1S	75MP-2S	75MP-4S	75MP-7S	75MP-8S	75MP-9S	MD75-MW01	MD75-MW02	MD75-MW03	MD75-MW04	MD75-MW05	MD75-MW06	MD75-MW07	MD75-MW08	MD75-MW09	MD75-MW10	MD75-MW11	MD75-MW12	MD75-MW13	MD75-MW14	MD75-MW15	MD75-MW16

a/ ft msl = feet above mean sea level.
 b/ ft bgs = feet below ground surface.
 c/ ft btoc = feet below top of casing.







Because organic carbon is present in the aquifer matrix, a somewhat retarded velocity (V_R) should be used for solute transport calculations. Section 4.2.4 presents TOC analysis results, and Section 5 contains V_R calculations.

3.6 GROUNDWATER USE

Groundwater from the shallow aquifer at MacDill AFB is not extracted for potable uses. A total of 76 private wells were identified in a residential area located directly north of the Base during a 1988 groundwater use survey (Engineering-Science, Inc., 1988). However, few of these wells were located within a 0.5-mile radius of Site 57. The private well nearest to Site 57 was located on Shelton Street, approximately 0.47 mile north of Pumphouse 77, and was used for irrigation. Pumphouse 75 is located approximately 1,900 feet southwest of Pumphouse 77; therefore, this irrigation well is probably at least 0.6 mile north of Pumphouse 75. There are no private wells located on the Base (BVWS, 1995). The nearest Hillsborough County designated Wellhead Protection Area is located approximately 13 miles north of the Base. Therefore, there are no public water supply wells within 0.5-mile of Site 57 [Southwest Florida Water Management District (SWFMD), 1988].

SECTION 4

NATURE AND EXTENT OF CONTAMINATION AND SOIL AND GROUNDWATER GEOCHEMISTRY

4.1 SOURCES OF CONTAMINATION

Potential contamination sources at Pumphouse 75 include the jet fuel pipelines located southwest of the pumphouse building, the jet fuel USTs and associated piping, and historical surface releases of petroleum fuels in the vicinity of the USTs. The groundwater quality data collected by BVWS (1995) and Parsons ES as part of this TS indicate that the jet fuel pipelines, which are present near the water table at a depth of approximately 3 feet bgs (Jackson, 1995), are the major source of dissolved BTEX contamination in the groundwater. No leaking tanks or major spills have been documented at the site. The USTs have reportedly passed recent tightness tests, but the jet fuel pipelines have not been tested. Pipeline testing is scheduled for early 1996 (Jackson, 1995).

As described in Section 1.2, historically 1 quart of fuel from each underground tank was visually inspected for water content daily, and after inspection the fuel was poured on the ground (EA, 1991). Groundwater quality data suggest that these releases constitute a secondary, relatively minor source of dissolved BTEX contamination at this site.

4.2 SOIL CHEMISTRY

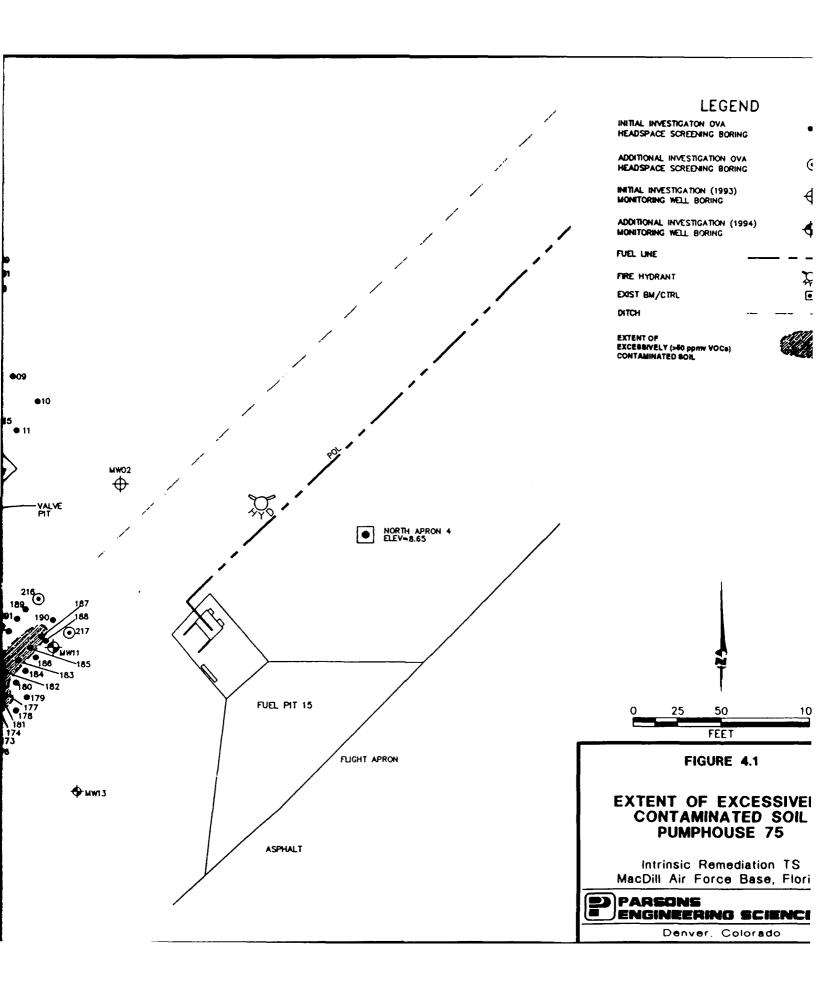
4.2.1 Soil Headspace Screening

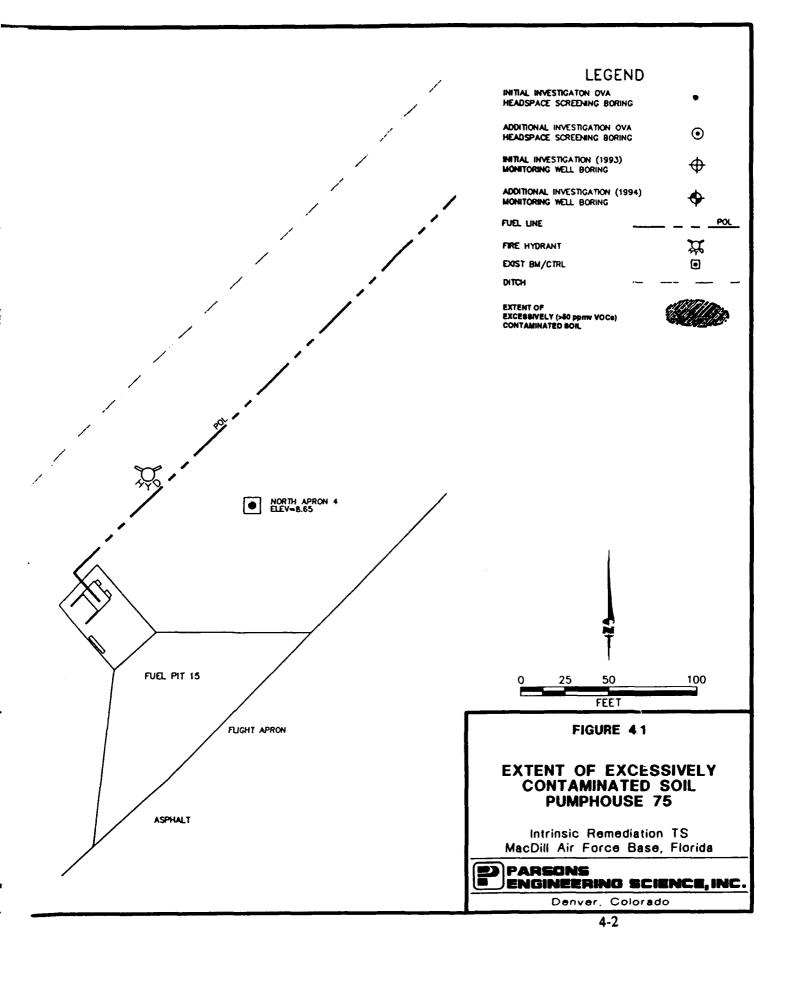
Soil headspace screening using an OVA was performed by BVWS (1995) to preliminarily delineate the lateral extent of petroleum-contaminated soil at Pumphouse 75. Soils exhibiting a headspace vapor concentration of 50 parts per million, volume per volume (ppmv) or greater were considered to be excessively contaminated. OVA screening samples were composited from the 0- to 3.5-foot depth interval at a total of 207 locations. In addition, OVA headspace screening was performed on soil samples collected at 2-foot intervals during the drilling of five monitoring wells (MD75-MW01 through MD75-MW05). The area of excessively contaminated soil delineated during this screening survey is shown on Figure 4.1, and the soil screening results are provided in Appendix A.

4.2.2 Magnitude and Extent of BTEX in Soil

During the BVWS (1995) investigation, a total of 10 soil samples from five boreholes were analyzed for petroleum constituents at a laboratory. Eighteen additional







soil samples from 10 boreholes (excluding QC samples) were collected by Parsons ES in March 1995 and chemically analyzed for petroleum constituents. Analytical results from the Parsons ES sampling are summarized in Table 4.1, and both BVWS and Parsons ES soil BTEX results are plotted on Figure 4.2.

Significantly elevated BTEX concentrations were detected in samples from 75SS-1 (3-5 feet bgs), 75SS-2 (3-5 feet bgs), 75MP-2 (2-4 feet bgs) and MD75-MW01 (2-3 feet bgs). The lateral distribution of these detections either suggests the existence of multiple sources, or that free product may have migrated downgradient from the source area, leaving residual light, nonaqueous-phase liquid (LNAPL) contamination in a smear zone bordering the water table. Residual LNAPL is defined as product that is trapped in the aquifer matrix by the processes of cohesion and capillarity, and therefore will not migrate within the aquifer or flow from the aquifer matrix into a well under the influence of gravity. The detection of BTEX at a concentration of 90,100 JH µg/kg at MD75-MW01 is anomalous given the lack of significant dissolved BTEX detections in groundwater from that well. In addition, this detection was not confirmed by analytical results for soil samples from adjacent monitoring point 75MP-5. Except for MD75-MW01, the lack of significant BTEX detections in the remainder of the collected samples effectively bounds the contaminated area laterally. The lack of significant BTEX detections below a depth of 5 feet (Table 4.1), combined with the shallow depthof the fuel pipelines (3 feet bgs) believed to be the primary contaminant source, suggests that the contamination is mostly restricted to the top 5 to 6 feet of the soil column.

4.2.3 Magnitude and Extent of Total Petroleum Hydrocarbons in Soil

Soil samples collected by BVWS (1995) were analyzed for total recoverable petroleum hydrocarbons (TRPH) using USEPA Method 418.1. All samples collected by Parsons ES were analyzed for TVH using EPA Method 8015, modified (California Leaking Underground Fuel Tank Task Force, 1989), and most of the samples also were analyzed for TEH using the same method. Analytical results for the Parsons ES samples are summarized in Table 4.1, and the BVWS results are provided in Appendix A.

The magnitude and distribution of significantly elevated TRPH, TVH, and TEH concentrations correlate well with the observed BTEX concentrations. Each of the four locations containing elevated BTEX levels, described in Section 4.2.2, were also characterized by elevated total petroleum hydrocarbon (TPH) levels. Similarly, TPH detections were relatively insignificant in the remainder of the samples analyzed for this parameter. Comparison of detected concentrations of TEH [up to 15,000 milligrams per kilogram (mg/kg)] and TVH (up to 4,800E mg/kg) indicate that diesel-range hydrocarbons are more prevalent than gasoline-range hydrocarbons. The 'E' qualifier in the TVH concentration indicates that it is a laboratory-extrapolated value.

4.2.4 Total Organic Carbon

TOC concentrations are a measure of the amount of organic matter sorbed on soil particles or trapped in the interstitial passages of a soil matrix. The TOC concentration in the saturated zone is an important parameter used to estimate the amount of contaminant that could potentially be sorbed to the aquifer matrix. Sorption results in

TABLE 4.1 1995 SOIL AND SEDIMENT DATA FOR FUEL-RELATED COMPOUNDS PUMPHOUSE 75 INTRINSIC REMEDIATION TS MACDILL AIR FORCE BASE, FLORIDA

.2,3,4	TMB"	(µg/kg)		ND	ND	2300	5.01	9.3	ND	14	1.31	ND	ND	ND	NA	ND	12000	NA	34	54	2000	34	Ω	1.93	ND	QX	NA	₽ P
1,2,3-	TMB	(µg/kg)		ND	ND	1400	ND	QN	ND	QN	ND	ND	ND	ND	NA	ND	2300	NA	ND	ND	46000	9.83	ΩÑ	Q.	QN	QN	NA	S
1,2,4-	TMB	(µg/kg)		ND	ND	2000	ND	ND	ND	ND	ND	ND	ND	ND	NA	0.53	2200	NA	ND	ND	73000	213	QΝ	QN	ND	QN	NA	Š
1,3,5-	TMB	(µg/kg)		ND	ΩN	1800	ND	ND	ND	ΩN	ΩN	QN	ND	ND	NA	0.6J	3200	NA	ΩN	QN	00065	223	QΝ	QN	QN	QN	NA	R
Chloro-	benzene TMB	(µg/kg)		ND	ND	150J ^U	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	340	NA	ND	ND	4500	QN	ΩN	QN	QN	ND	NA	Ş
	TVH ^b ′	mg/kg		ND	ΩN	3000E	ND	NA	ND	QN	ND	ΩN	ΩN	ND	ΩN	ΩN	230	290	0.36	NA	4800E	ΩN	QN	ND	ND	QN	QN	6
	TEH	$(\mu g/kg) (\mu g/kg) (mg/kg)^{4} (mg/kg) (\mu g/kg) (\mu g/kg) (\mu g/kg) (\mu g/kg) (\mu g/kg)$		ND	NA ^{j'}	4000	17	NA	ND	NA	NA	ND	ND	NA	NA	NA	13	NA	NA	NA	15000	16	ND	ND	ND	ND	ND	Y.
Total	BTEX	(µg/kg)		QN	ND	1950	ND	4.7J	ND	18.6J	ND	ND	ND	ND	NA	ND	5487	NA	ND	ND	86630J	961	0.73	ND	ND	ΩN	NA	3.31
Total	Xylenes	(µg/kg)		ND	ND	640	ND	3.5J	ND	1.5J	ND	ND	ND	ND	NA	ND	4900	NA	ND	ND	67000	25J	0.73	ND	ND	ND	NA	ΩN
	Interval Benzene Toluene Ethylbenzene Xylenes	(µg/kg)		QN	ND	089	ND	1.23	ΩN	16	ND	ND	ND	ND	NA	QN	550	NA	QN	ND	14000	39	QN	ND	QN	ND	NA	ΔÑ
	Toluene	(µg/kg)		ND	ND	630	ND	ND	QN	0.93	ND	QN	ND	ND	NA	QN	37	ΝA	ND	ND	5300	ND	ND	ND	QN	ND	NA A	Q
	Benzene	(μg/kg) ⁸ (μg/kg)		ND"	QN	QN	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	NA	ND	ND	330J	32	ND	ND	ND	ND	ΝA	3.31
Sample	Interval	(feet)		3-5	3-5	2-4	01-8	01-8	3-5	8-10	51-61	4-6	4-6	8-9	8-9	8-9	3-5	3-5	6-2	6-2	3-5	9-11	3-4	8-10	3-5	6-6	6-2	22-24
	Sample	Date		3/11/6	3/11/95	3/13/95	3/13/95	3/13/95	3/14/95	3/14/95	3/14/95	3/14/95	3/14/95	3/14/95	3/14/95	3/15/95	3/13/95	3/13/95	3/13/95	3/13/95	3/13/95	3/13/95	3/13/95	3/13/95	3/15/95	3/15/95	3/15/95	3/15/95
		Sample Location	Soil Samples	1-4MS1	75MP-1 dup	75MP-2	75MP-2	75MP-2 dup	75MP-3	75MP-4	15MP-4	75MP-5	75SS-15 dup	75MP-5	75MP-5 dup	75MP-7	1-8857	75SS-1dup	1-8857	75SS-1 dup	2-SS\$ <i>L</i>	75SS-2	7588-3	£-SS\$ <i>L</i>	9-8857	9-8851	75SS-6 dup	7585-6

1995 SOIL AND SEDIMENT DATA FOR FUEL-RELATED COMPOUNDS INTRINSIC REMEDIATION TS TABLE 4.1 (Continued) PUMPHOUSE 75

MACDILL AIR FORCE BASE, FLORIDA

		Sample				Total Total	Total			Chloro- 1,3,5- 1,2,4- 1,2,3- ,2,3,4-	1,3,5-	1,2,4-	1,2,3-	,2,3,4
	Sample	Interval	Benzene	Toluene	nterval Benzene Toluene Ethylbenzene Xylenes BTEX	Xylenes	BTEX	TEH" TVH" benzene TMB" TMB" TMB" TMB	TVH	benzene	TMB	TMB	TMB*	TMB ^{f,}
Sample Location	Date	(feet)	(feet) (μg/kg) ^ε (μg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(ug/kg)	(mg/kg) ^{b/}	(mg/kg	(mg/kg (µg/kg) (µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	μg/kg)
Sediment Samples														
75SD-1	3/15/95	0-0.5	QN	ND	ND	QN	ND	NA	ΩN	ND	QN	QN	ND	QN
75SD-2	3/15/95	0-0.5	QN	ND	ND	1.0J	1.0J	AN	QN	ND	ND	QN	QN	δ
75SD-3	3/15/95	0.0.5	QN	ND	ND	0.93	0.93	NA	ND	ND	ND	ND	QN	ΩN
75SD-4	3/15/95	0.0.5	ND	ND	ND	QN	ND	NA	NA	ND	ND	QN	ΩN	19.6

a/ TEH = total extractable hydrocarbons.

b/ TVH = total volatile hydrocarbons.

c/ 1,3,5 TMB = 1,3,5 trimethylbenzene.

d/ 1,2,4 TMB = 1,2,4 trimethylbenzene.

e/ 1,2,3 TMB = 1,2,3 trimethylbenzene.

f/ 1,2,3,4 TMB = 1,2,3,4 tetramethylbenzene.

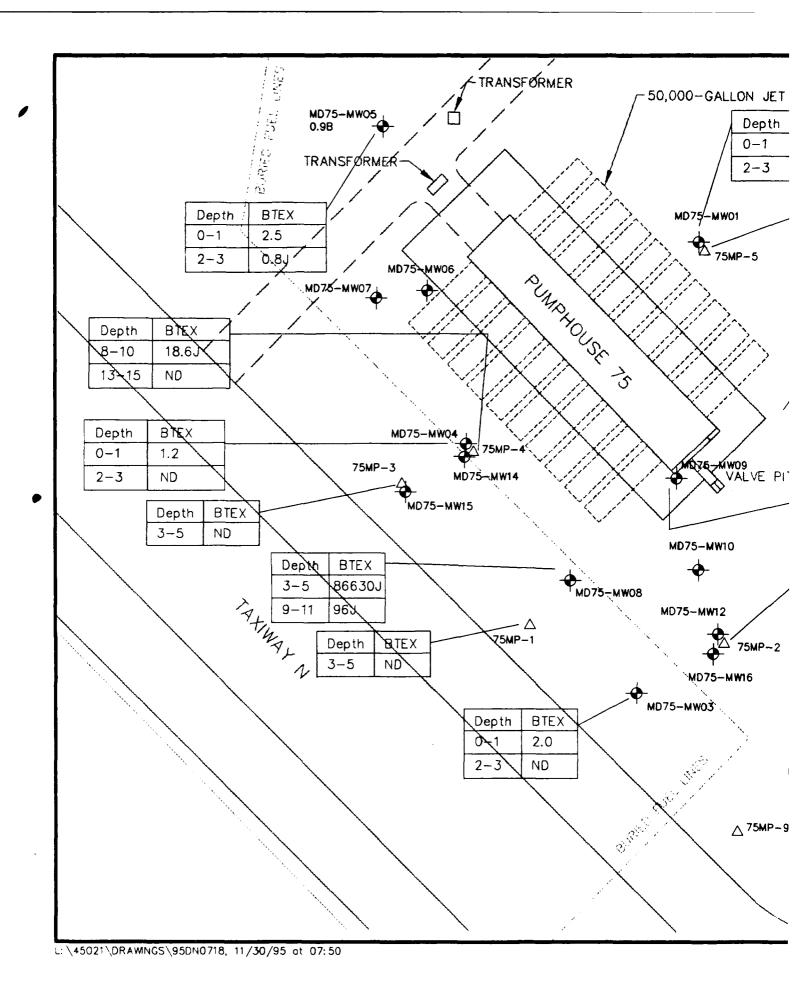
g/ µg/kg = micrograms per kilogram.

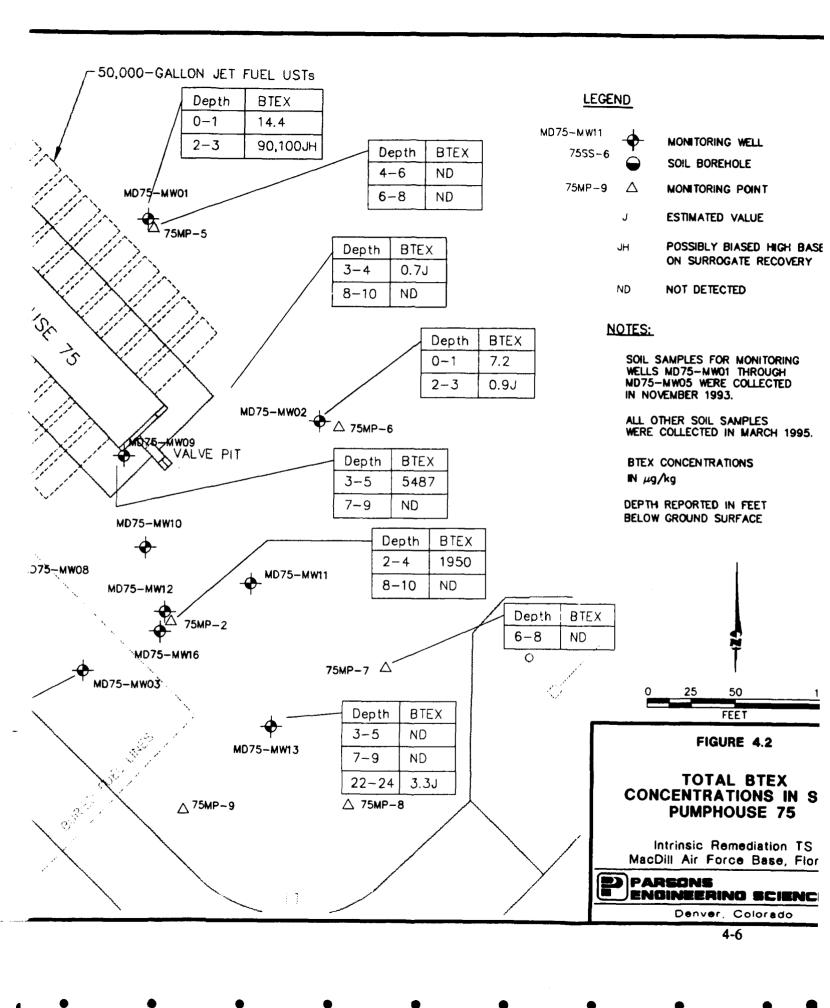
h/ mg/kg = milligrams per kilograms. i/ ND = not detected.

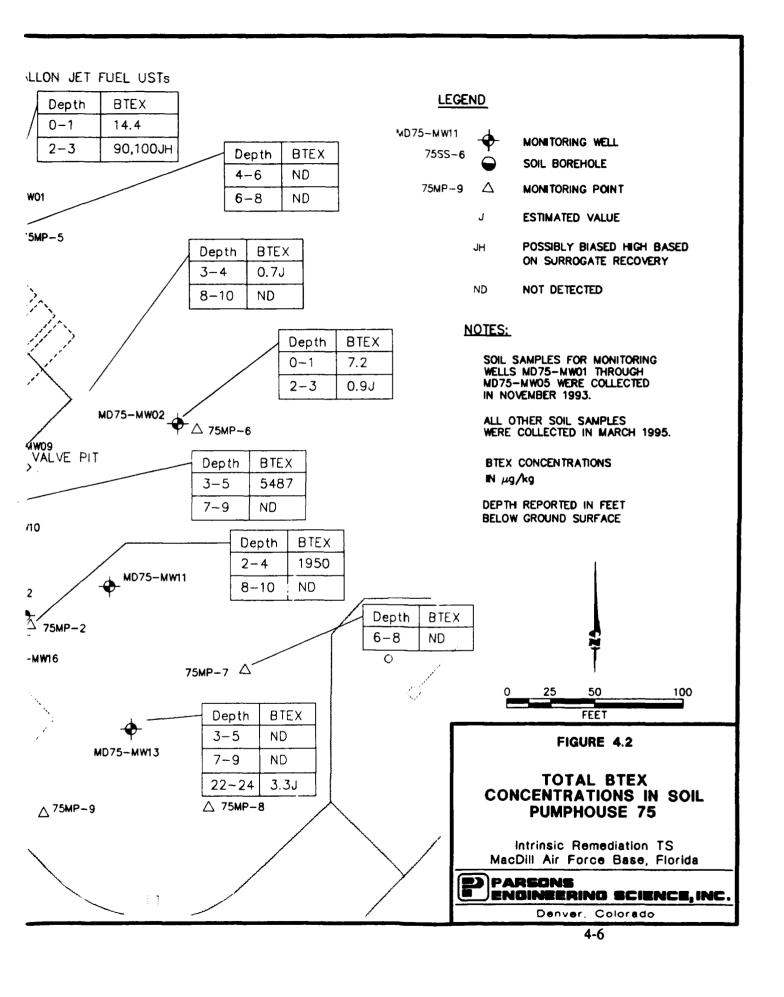
// NA = not analyzed for this compound.

K/ E = laboratory-extrapolated value.
 J = laboratory estimate.
 J = laboratory estimate.
 Note: Analysis methods included SW8015M for TEH and TVH, and SW8020 for aromatic volatile organic compounds, including TMB compounds.

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(3)

retardation of the contaminant plume migration relative to the average advective groundwater velocity.

Samples for TOC analysis were collected in sandy material in the vicinity of the water table at boreholes 75SS-4, 75SS-6, and 75SS-7. To avoid interference from carbon present in fuel hydrocarbons, these samples were collected from locations where data indicated that little or no hydrocarbon contamination was present. The TOC content of the soil at these locations was less than 0.06 percent (Table 4.2).

4.2.5 Magnitude and Extent of Petroleum Hydrocarbons In Sediment

Four sediment samples (75SD-1 through 75SD-4) were collected in and adjacent to the shallow drainage swale located southeast of the pumphouse building (Figure 2.2). Surface water is present in this swale only after storm events, and flow is toward the northeast. These samples were analyzed for aromatic VOCs and TVH. Trace concentrations of xylenes, ranging from 0.9J to 1.0J μ g/kg, were detected in two samples, and the remaining analytes were not detected (Table 4.1). BVWS (1995) obtained three sediment samples from this swale in 1994, and analyzed them for aromatic and halogenated VOCs, polynuclear aromatic hydrocarbons (PAHs), TRPH, and Resource Conservation and Recovery Act (RCRA) metals. Analysis results are contained in Appendix A. Similar to the March 1995 samples, only trace concentrations (less than 3 μ g/kg) of VOCs were detected. Surface water was not present at the site during field activities, and therefore surface water samples were not collected.

4.3 GROUNDWATER CHEMISTRY

Biodegradation of fuel hydrocarbons can occur when an indigenous population of hydrocarbon-degrading microorganisms is present in the aquifer and sufficient concentrations of electron acceptors and nutrients, including fuel hydrocarbons, are available to these organisms. Three lines of evidence can be used to document the occurrence of natural attenuation:

- Geochemical evidence:
- · Documented loss of contaminant mass at the field scale; and
- Laboratory microcosm studies.

The first line of evidence (geochemical evidence) is used herein to support the occurrence of natural attenuation, as described in the following sections. Because this line of evidence strongly suggests that natural attenuation is occurring at this site, laboratory microcosm studies were not deemed necessary. Although available groundwater quality data suggest that loss of contaminant mass may be occurring at the site, there is not sufficient historical data and vertical control to document that line of evidence.

TABLE 4.2 SOIL TOTAL ORGANIC CARBON RESULTS PUMPHOUSE 75 INTRINSIC REMEDIATION TS

INTRINSIC REMEDIATION TS
MACDILL AIR FORCE BASE, FLORIDA

Sample Location	Depth (feet bgs)	Total Organic Carbon ^a (%)
75SS-4	3 - 4	< 0.06
75SS-6	3 - 5	< 0.06
75SS-7	4 - 6	< 0.06
75SS-17 dup	4 - 6	< 0.06

a/ moisture adjusted result.

Note: Analysis method was SW9060, modified.

4.3.1 Dissolved Hydrocarbon Contamination

Laboratory analytical results for groundwater samples collected during previous site investigations (BVWS, 1995) revealed the presence of dissolved fuel hydrocarbon contamination in the shallow saturated zone. BVWS groundwater quality results are contained in Appendix A. Groundwater samples collected in March 1995 by Parsons ES personnel confirmed these results. Table 4.3 summarizes groundwater contaminant data for these samples. Free-phase product (i.e., mobile LNAPL) was not observed during any of the investigations.

4.3.1.1 Dissolved BTEX Contamination

Figure 4.3 is an isopleth map showing the distribution of total BTEX dissolved in groundwater in March 1995. Where nested monitoring points or wells are present, isopleths are drawn using the maximum concentration detected at that location. The maximum observed total BTEX concentration was 676 µg/L at monitoring well MD75-MW04. Elsewhere, the detected total BTEX concentrations ranged from 0.6B µg/L at wells MD75-MW15 and MD75-MW02 to 589 μg/L at monitoring point 75MP-4S. The plume is elongated parallel to the buried fuel lines and the direction of groundwater flow (Figure 4.3). Comparison of March 1995 sampling results with data from January and November 1994 suggests that dissolved BTEX concentrations in the shallow sand zone have generally decreased over time. For example, the total BTEX concentration detected at well MD75-MW04 was 1,071 µg/L in January 1994, 976 μg/L in November 1994, and 676 μg/L in March 1995. Similarly, the detected total BTEX concentration at well MD75-MW08 decreased from 541 µg/L in November 1994 to 377B μg/L in March 1995. The "B" data qualifier indicates that one or more of the BTEX compounds also was detected in an associated laboratory blank sample. BTEX concentrations detected in downgradient wells (e.g., MD75-MW09, MD75-MW10, and MD75-MW12) have not increased significantly over time, indicating that the observed decreases in the source area are not wholly due to migration of the contaminants in the downgradient direction.

The detection of dissolved BTEX in the two deeper wells (MD75-MW14 and MD75-MW16) located in the center of the plume (Figure 4.3) suggests that the BTEX contamination may be migrating vertically as well as horizontally. However, the introduction of dissolved BTEX into the deeper wells from shallower intervals during well purging cannot be ruled out. In both MD75-MW14 and MD75-MW16, the isolation casing and underlying bentonite seal do not extend a significant distance into a confining layer. Therefore, it is conceivable that shallow groundwater containing dissolved BTEX was drawn down into the deeper wells during purging and/or development activities. This observation is supported by the similarity in BTEX concentrations detected in the shallow and deep wells constituting a well cluster. The March 1995 dissolved BTEX concentrations detected in wells MD75-MW04 (shallow) and -MW14 (deep) were 676 and 515 µg/L, respectively. Similarly, the dissolved BTEX concentrations detected in wells MD75-MW12 and -MW16 were 121B and 128 ug/L, respectively. Comparison of November 1994 and March 1995 sampling results indicate that the dissolved BTEX concentrations in the deep wells have increased since 1994. In November 1994, the sample from well MD75-MW14 contained 95 µg/L of dissolved BTEX (as opposed to 515 µg/L in March 1995), and the sample from well MD75-MW16 contained 53 µg/L of BTEX (as opposed to 128 µg/L in March 1995).

TABLE 4.3 1995 GROUNDWATER QUALITY DATA FOR FUEL-RELATED COMPOUNDS AND TOC

INTRINSIC REMEDIATION TS MACDILL AIR FORCE BASE, FLORIDA

1,2,3,4	TMB ^{e'}	(µg/L)			=	99	ND	78	8.3	17	NA	12	N Q	ND DX	ND DX	ND	ND DI	Q.	ND	ND	£	92.0	83E"	S	3.2
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1,2,3-	TMB	(µg/L)	C.N		£	110	ND	41	ND	8.0	NA	22	ND	ND	6.0	ND	ND	ND	ND	QN.	Æ	8.0	1.6	0.5	£
1,2,4-	TMB*	(µg/L)	4		£	140	ND	41	0.4	1.5	NA A	90	ND	ND	ND	ND	ND	ND	ND	ON.	Ą	2.1	2.1	ND DX	g
1,3,5-	TMB	(µg/L)	Ę		£	70	ND	12	ND	ND	NA AN	25	ND	ND	ND	ND	ND	ND	ND	ND	ďΝ	ND	ΩN	9.0	0.5
Chloro-	Benzene	(µg/L)	div.	2	Q	ND	ND	3.5	ND	ND	NA	ND	ND	ND	QN	ND	ND	ND	ND	ND	ND	2.2	2.9	ND	£
	TOC"	(mgC/L	VX	5	A'N	AN	NA	NA	NA	1	NA AN	NA AN	NA	5.18	NA	5.28	4.68	NA	NA	NA	NA	NA	NA	7.42	Y.V
	TVHb	(mg/L)	ď	2	Q.	1.8	0.2	2.6	ND	0.1	0.1	0.1	0.1	ND	ND	ND	ND	ND	ND	ND	0.2	2.9	3.5	ND	0.1
	TEH	(mg/L) ^{i/}	VAIA		٧×	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	15	NA	NA	NA
Total	втех	(µg/L)	2 0.1		7.21	233	ND	589	2.3B	3.7B	NA	18.7	ND	ND	ND	ND	9.1	ND	ND	0.6B	ND	676.2	8.661	0.9B	8.0
Total	Xylenes	(μg/L)	Z.	2	Ð	88	ND	43	0.6B	0.5B	NA	11	UD	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.7	ND	₽ P
	Ethylbenzene	(µg/L)	4	2	5	90	ND	460	ND	3.2	NA	4	ND	QN	ND	ND	QN	ND	ND	ND	ND	280	100B	ND	8.0
	Toluene	(μg/L)	3.016		0.5J	82	ND	36	0.9B ^{m/}	ND	NA	3.3	ND	ND	ND	ND	9.1	ND	ND	0.6B	ND	2.2	3.1	0.9B	S S
	Benzene	(μg/L) ^{b/}	VIN'	2	1.71	13	ND	50	8.0	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	94.0	96	ND	£
	Sample	Date	30/31/2	27.001.00	3/16/95	3/31/95	4/2/95	3/31/95	3/29/95	3/29/95	3/29/95	4/2/95	4/2/95	3/30/62	3/30/95	3/30/95	3/30/95	3/30/95	3/29/95	3/29/95	3/31/95	3/31/95	3/31/95	3/29/95	3/31/95
		Sample Location	25MD 16	C1- 1147C/	7SMP-1D	75MP-2S	75MP-3D	75MP-4S	US-AMS7	D9-4WSL	75MP-6D dup	75MP-7S	75MP-7D	75MP-8S	75MP-8D	75MP-28S dup	75MP-9S	75MP-9D	MD75-MW01	MD75-MW02	MD75-MW03	MD75-MW04	MD75-MW04 dup	MD75-MW05	MD75-MW06

*

TABLE 4.3 (Continued) 1995 GROUNDWATER QUALITY DATA FOR FUEL-RELATED COMPOUNDS AND TOC MACDILL AIR FORCE BASE, FLORIDA INTRINSIC REMEDIATION TS PUMPHOUSE 75

						Total		:		Chloro-	1,3,5-	1,2,4-	1,2,3-	1,2,3,4
Toluene Ethylbenzene	Ethylbenzene	Ethylbenzene	Ethylbenzene		Xylenes	BTEX	TEH	TVH ^b ′	Toce	Benzene	TMB	TMB.	TMB,	TMB
Date $\left (\mu g/L)^{b'} \right \left (\mu g/L) \right $ ((μg/L) (μg/L)	(μg/L) (μg/L)	一	\sim	(µg/L)	(µg/L)	(mg/L) ^V	(mg/L)	(mgC/L	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)
4/2/95 ND ND ND	ND		QN		ND	SP.	NA	ND	NA	QN.	Æ	QN.	£	Ę
3/31/95 140B 17 110B	17		110B	_	110	377B	14	2	NA	1.3	33	45	64	61E
3/30/95 ND 1 57	-	1 57	57	_	1.1	59.1	NA	1.2	NA	8.0	ND	0.7	0.4	298.9
3/30/95 7.2 ND 65	QN		65	_	1.6	73.8	NA	0.5	NA	ND	1.5	ND	Q.	28
3/30/95 ND ND ND	ND		QN	_	6.0	0.9	NA	QN	NA	ND	ND	0.5	£	QN ON
3/31/95 45 1.5 67B	1.5	_	67B		7.5	121B	3.1	9.0	NA	0.5	6.2	20	3.2	41
3/30/95 1.3 ND 6.5	QN		6.5		1.2	6	NA	ND	NA	ND	ND	2.1	QN	1.1
3/31/95 170 1.2 330.0	1.2		330.0	_	14	\$15.2	NA	3.5	NA	1.5	1	1.7	1.7	53
4/2/95 ND ND ND	ND		QN	$\overline{}$	0.6B	0.6B	NA	ND	NA	ND	ND	Æ	£	0.4B
3/31/95 45 0.9 79	6.0		79	—	2.7	127.6	NA	0.7	NA	0.7	ND	1.4	6.0	50
3/30/95 ND ND ND	QN		ΩN		QN O	ND	NA	NA	NA	ND	ND	QN Q	Ę	Ą
3/30/95 ND ND ND	ND		QN		ΩŽ	ND	NA	NA	NA	ND	ND	ND	QN O	ΩN

a/ TEH = total extractable hydrocarbons.

b/ TVH = total volatile hydrocarbons.

c/ TOC = total organic carbon.

d/ 1,3,5-TMB = 1,3,5-trimethylbenzene.

e/ 1,2,4-TMB = 1,2,4-trimethylbenzene.

f/ 1,2,3-TMB = 1,2,3-trimethylbenzene.

g/ 1,2,3,4-TMB = 1,2,3,4-tetramethylbenzene.

h/ $\mu g/L = micrograms per liter.$

i/ mg/L = milligrams per liter.

j/ ND = compound not detected.

k/J = laboratory estimate.

1/ NA = compound not analyzed for.

m/B = compound detected in blank.

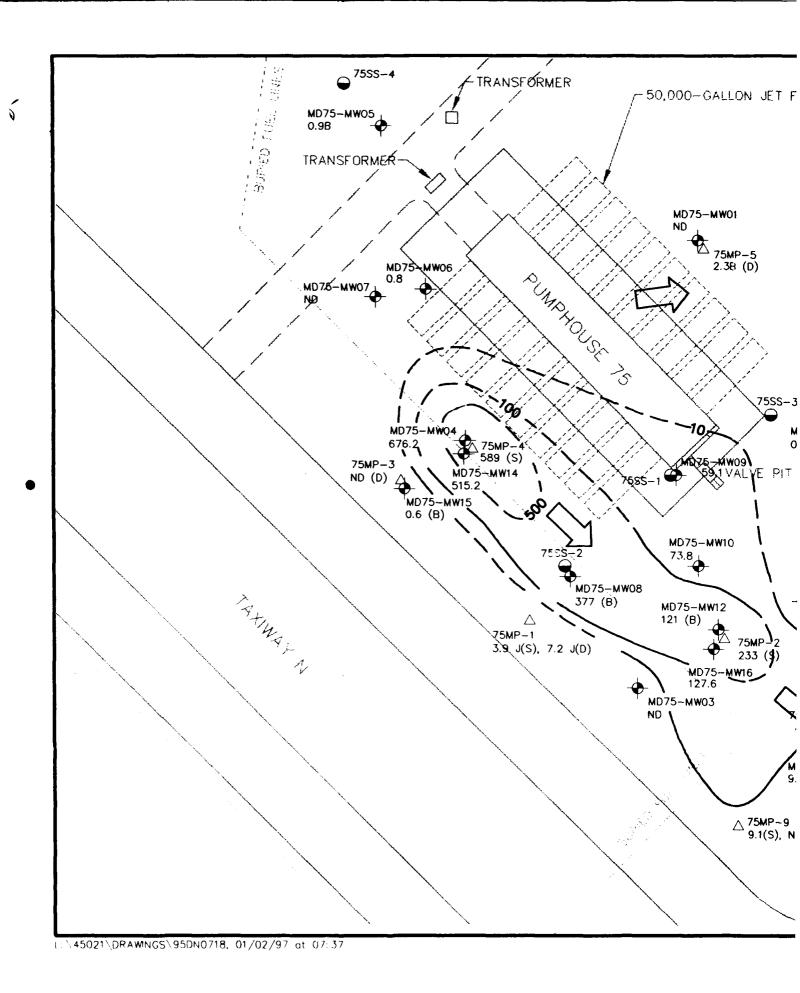
n/E = laboratory-extrapolated value.

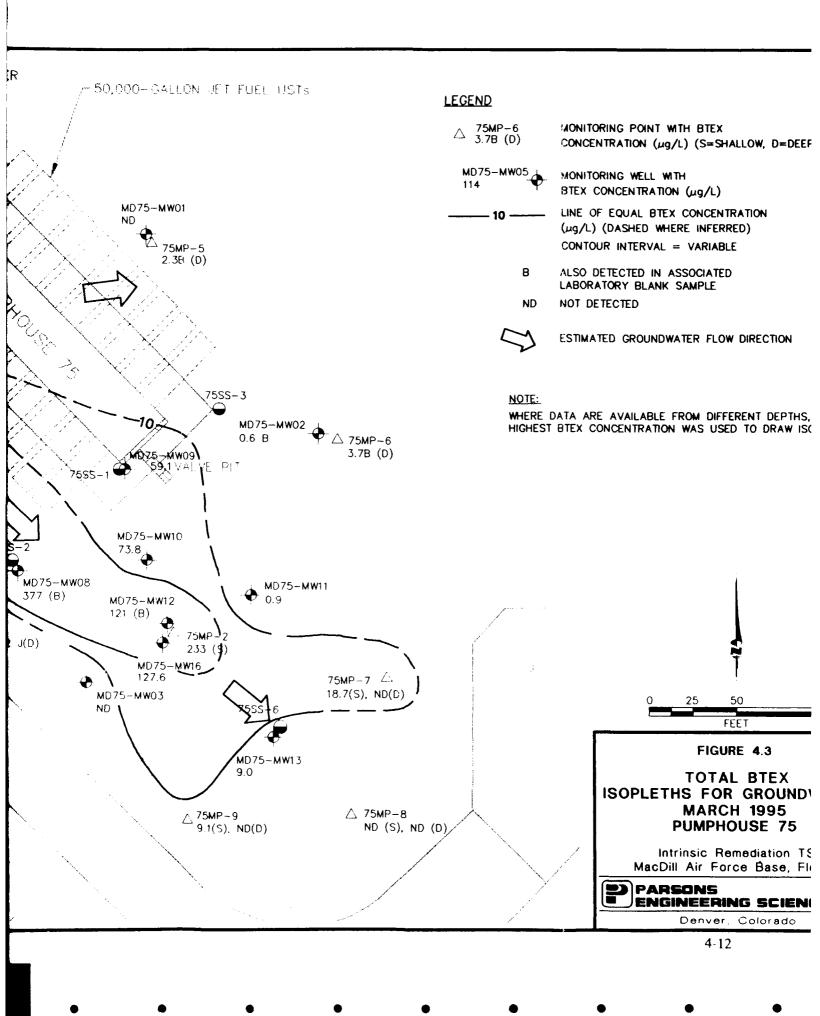
Note: Analysis methods included SW8015M for TEH and TVH, E415.1 for

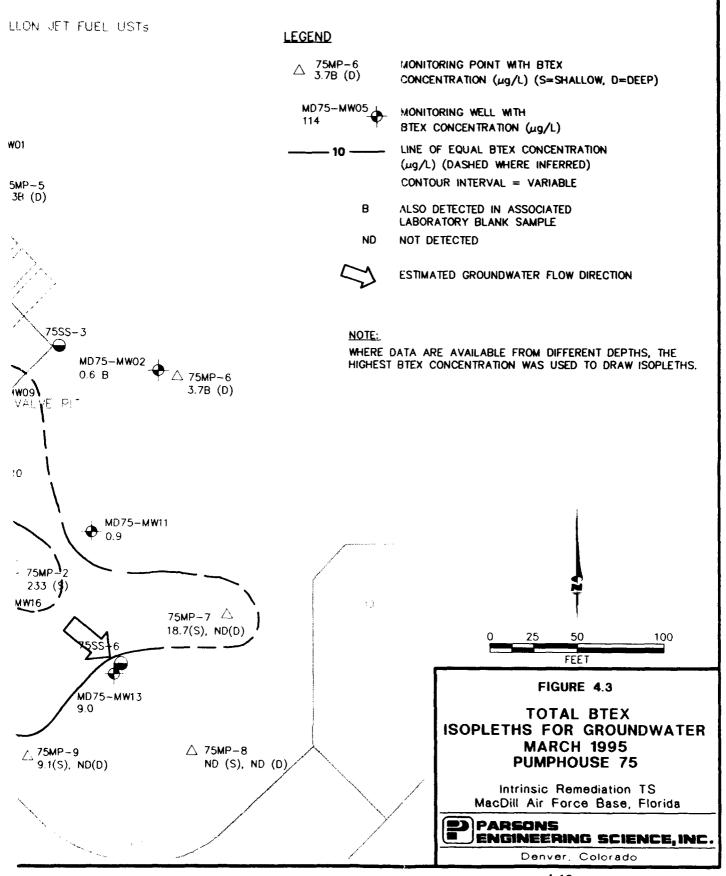
TOC, and SW8020 for aromatic volatile organic compounds,

including TMB compounds.

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Except for the detections described above for MD75-MW14 and -MW16, the largest BTEX detection in other samples collected from similar depths was 7.2J μ g/L at monitoring point 75MP-1D, indicating that the lateral extent of BTEX contamination in deeper portions of the surficial aquifer is restricted to the immediate vicinity of the pumphouse. The degree to which geochemical data support the presence of BTEX contamination at deeper intervals is discussed in Sections 4.3.2.1 through 4.3.2.7.

4.3.1.2 Dissolved TPH Contamination

Groundwater samples collected by BVWS (1995) were analyzed for TRPH using USEPA Method 418.1 (see Appendix A for results). Samples collected by Parsons ES were analyzed for TVH using USEPA Method SW8015, modified, and three samples were also analyzed for TEH using USEPA Method 8015, modified. The TVH results correlate well with the BTEX results, with the maximum TVH concentration of 3.5 mg/L detected at monitoring wells MD75-MW04 and MD75-MW14 (Table 4.3). As stated in Section 4.3.1.1, the similarity between the shallow and deep petroleum hydrocarbon concentrations at the location of this well cluster suggests that the deep detections may be occurring as a result of cross-contamination from the shallow sand zone. The TEH concentrations are all substantially greater than the corresponding TVH concentrations, indicating that, similar to soil contamination, diesel-range petroleum hydrocarbons are more abundant than gasoline-range hydrocarbons in the groundwater beneath this site.

4.3.1.3 Chlorinated Volatile Organic Compounds

Groundwater samples collected in 1995 by Parsons ES were analyzed for chlorinated VOCs and ethylene (which is a byproduct of chlorinated solvent degradation). Table 4.4 contains analytical data for these compounds. The VOC cis-1,2-dichloroethene (cis-1,2-DCE) was detected in the sample from deep monitoring well MD75-MW14 at a concentration of 1 μ g/L. Chlorinated solvents were not detected in the remaining samples. Ethylene was detected in three samples at the following concentrations: 0.001J mg/L at 75MP-2S, 0.001J mg/L at 75MP-4S, and <0.003 mg/L at MD75-MW04

4.3.2 Inorganic Chemistry and Geochemical Indicators of Biodegradation

Microorganisms obtain energy for cell production and maintenance by catalyzing the transfer of electrons from electron donors to electron acceptors. This results in the oxidation of the electron donor and the reduction of the electron acceptor. Electron donors at the site are natural organic carbon and fuel hydrocarbon compounds. Fuel hydrocarbons are completely degraded or detoxified if they are utilized as the primary electron donor for microbial metabolism (Bouwer, 1992). Electron acceptors are elements or compounds that occur in relatively oxidized states, and typically can include oxygen, nitrate, ferric iron, sulfate, and carbon dioxide. Microorganisms preferentially utilize electron acceptors while metabolizing fuel hydrocarbons (Bouwer, 1992). DO is utilized first as the prime electron acceptor. After the DO is consumed, anaerobic microorganisms typically use electron acceptors (as available) in the following order of preference: nitrate, ferric iron hydroxide, sulfate, and finally carbon dioxide. Because the biodegradation of fuel hydrocarbons should deplete the concentrations of these electron acceptors, construction of isopleth maps depicting their

TABLE 4.4

1995 GROUNDWATER QUALITY DATA FOR CHLORINATED VOLATILE ORGANIC COMPOUNDS AND ETHYLENE PUMPHOUSE 75

INTRINSIC REMEDIATION TS MACDILL AIR FORCE BASE, FLORIDA

			J	Trans-	Cis-	Vinyl	
Sample	PCE*	TCE ^b	1,1-DCE°	1,2-DCE ^d	1,2-DCE*	Chloride	Ethylene
Identification	(ppb) ⁰	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppm) ^{g/}
75MP-2S	ND [₩]	ND	ND	ND	ND	ND	0.001J ^v
75MP-3D	ND	ND	ND	ND	ND	ND	ND
75MP-4S	ND	ND	ND	ND	ND	ND	0.001J
75MP-5D	ND	ND	ND	ND	ND	ND	ND
75MP-6D	ND	ND	ND	ND	ND	ND	ND
75MP-7D	ND	ND	ND	ND	ND	ND	ND
75MP-7S	ND	ND	ND	ND	ND	ND	ND
75MP-8D	ND	ND	ND	ND	ND	ND	ND
75MP-8S	ND	ND	ND	ND	ND	ND	ND
75MP-9D	ND	ND	ND	ND	ND	ND	ND
75MP-9S	ND	ND	ND	ND	ND	ND	ND
MD75-MW02	ND	ND	ND	ND	ND	ND	ND
MD75-MW03	ND	ND	ND	ND	ND	ND	ND
MD75-MW04	ND	ND	ND	ND	ND	ND	< 0.003
MD75-MW04 dup	ND	ND	ND	ND	ND	ND	NA
MD75-MW05	ND	ND	ND	ND	ND	ND	ND
MD75-MW06	ND	ND	ND	ND	ND	ND	ND
MD75-MW07	ND	ND	ND	ND	ND	ND	ND
MD75-MW08	ND	ND	ND	ND	ND	ND	ND
MD75-MW09	ND	ND	ND	ND	ND	ND	ND
MD75-MW10	ND	ND	ND	ND	ND	ND	ND
MD75-MW11	ND	ND	ND	ND	ND	ND	ND
MD75-MW12	ND	ND	ND	ND	ND	ND	ND
MD75-MW13	ND	ND	ND	ND	ND	ND	ND
MD75-MW14	ND	ND	ND	ND	1.0	ND	ND
MD75-MW14 dup	ND	ND	ND	ND	1.1	ND	NA
MD75-MW15	ND	ND	ND	ND	ND	ND	ND
MD75-MW16	ND	ND	ND	ND	ND	ND	ND

PCE = Tetrachloroethene.

Note: Analysis methods included Robert S. Kerr Standard Operating Procedure (RSKSOP)-148 for volatile organic compounds and RSKSOP-175 for ethylene.

by TCE = Trichloroethene.

^{o'} 1,1-DCE = 1,1 Dichloroethene.

d Trans-1,2-DCE = Trans-1,2,-Dichloroethene.

of Cis-1,2-DCE = Cis-1,2-Dichloroethene.

ppb = parts per billion.

y ppm = parts per million.

ND = compound not detected.

^V J = laboratory-estimated value.

 $^{^{}y}$ NA = compound not analyzed for.

concentrations relative to a dissolved fuel hydrocarbon plume can provide evidence of whether biodegradation is occurring, and the degree to which it is occurring.

During anaerobic biodegradation, there is an increase in the concentrations of metabolic byproducts derived from the microbial degradation of fuel hydrocarbons. Metabolic byproducts include ferrous iron produced during iron reduction, and methane produced during methanogenesis, which uses carbon dioxide as the electron acceptor. Therefore, isopleth maps depicting the concentrations of these byproducts provide additional evidence of biodegradation.

The driving force of BTEX degradation is electron transfer, as quantified by the Gibbs free energy of the reaction (ΔG_r) (Stumm and Morgan, 1981; Bouwer, 1994; Godsey, 1994). The value of ΔG_r represents the quantity of free energy consumed or yielded to the system during the reaction. Table 4.5 lists stoichiometry of the redox equations involving BTEX and the resulting ΔG_r . Although thermodynamically favorable, most of the reactions involved in BTEX oxidation cannot proceed abiotically because of the lack of activation energy. Microorganisms are capable of providing the necessary activation energy; however, they will facilitate only those redox reactions that have a net yield of energy (i.e., $\Delta G_r < 0$).

Depending on the types and concentrations of electron acceptors present (e.g., nitrate, ferric iron, sulfate, carbon dioxide), pH conditions, and redox potential, anaerobic biodegradation can occur by denitrification, ferric iron reduction, sulfate reduction, or methanogenesis. Other, less common anaerobic degradation mechanisms such as manganese reduction may dominate if the physical and chemical conditions in the subsurface favor use of these electron acceptors. Anaerobic destruction of BTEX compounds is associated with the accumulation of fatty acids, production of methane, solubilization of iron, and reduction of nitrate and sulfate (Cozzarelli et al., 1990; Wilson et al., 1990). In addition, an increase in alkalinity is often observed when BTEX compounds are being biodegraded. Environmental conditions and microbial competition will ultimately determine which processes will dominate. Vroblesky and Chapelle (1994) show that the dominant terminal electron accepting process can vary both temporally and spatially in an aquifer with fuel hydrocarbon contamination.

On the basis of available data, biodegradation of fuel hydrocarbons at Pumphouse 75 is occurring, and as discussed below, concentrations of methane and sulfate indicate that methanogenesis and sulfate reduction are the primary pathways for biodegradation. Concentrations of DO, nitrate, and ferrous iron also support the occurrence of biodegradation, but the trends are less apparent. Alkalinity data also support the occurrence of biodegradation. Geochemical parameters, and their relation to the distribution of dissolved BTEX in groundwater, are discussed in the following sections.

4.3.2.1 Dissolved Oxygen

DO concentrations were measured at monitoring wells and monitoring points in March 1995 (Table 4.6). Figure 4.4 is an isopleth map showing the distribution of DO concentrations in groundwater. The generally low DO concentrations both inside and outside of the contaminant plume indicate that the groundwater system is naturally low in DO, that DO is not an important electron acceptor at this site, and that the degradation mechanisms operating at the site are primarily anaerobic. Within the area

TABLE 4.5 COUPLED OXIDATION REACTIONS FOR BTEX COMPOUNDS PUMPHOUSE 75

INTRINSIC REMEDIATION TS MACDILL AIR FORCE BASE, FLORIDA

Coupled Benzene Oxidation Reactions	ΔG°, (kcal/mole Benzene)	ΔG°, (kJ/mole Benzene)	Stoichiometric Mass Ratio of Electron Acceptor to Compound
$7.5O_2 + C_6H_6 \Rightarrow 6CO_{2,g} + 3H_2O$ Benzene oxidation /aerobic respiration	-765.34	-3202	3.07:1
$6NO_3 + 6H^+ + C_6H_6 \Rightarrow 6CO_{2,g} + 6H_2O + 3N_{2,g}$ Benzene oxidation / denitrification	-775.75	-3245	4.77:1
$\frac{60 \text{H}^+ + 30 \text{Fe}(OH)_{3,a} + C_6 \text{H}_6 \Rightarrow 6 \text{CO}_2 + 30 \text{Fe}^{2+} + 78 \text{H}_2 O}{\text{Benzene oxidation / iron reduction}}$	-560.10	-2343	21 5:1 ²
$75H^+ + 3.75SO_4^2 + C_6H_6 \Rightarrow 6CO_{2g} + 3.75H_2S^o + 3H_2O$ Benzene oxidation / sulfate reduction	-122.93	-514.3	4.61:1
4.5 $H_2O + C_6H_6 \Rightarrow 2.25 CO_{2,q} + 3.75 CH_4$ Benzene oxidation / methanogenesis	-32.40	-135.6	0.77:1 ^{b/}

Coupled Toluene Oxidation Reactions	ΔG°, (kcal/mole Toluene)	ΔG° _r (kJ/mole Toluene)	Stoichiometric Mass Ratio of Electron Acceptor to Compound
$90_1 + C_6H_1CH_3 \Rightarrow 7CO_{1a} + 4H_1O$ Toluene oxidation /aerobic respiration	-913.76	-3823	3.13:1
7.2 NO ₃ + 7.2 H ⁺ + C ₆ H ₃ CH ₃ \Rightarrow 7 CO _{2,g} + 7.6 H ₂ O + 3.6 N _{2,g} Toluene oxidation / denitrification	-926.31	-3875	4.85:1
$72H^{+} + 36Fe(OH)_{3A} + C_{6}H_{3}CH_{3} \Rightarrow 7CO_{2} + 36Fe^{2+} + 94H_{1}O$ Toluene oxidation / iron reduction	-667.21	-2792	21.86:1 ^{al}
$9H^+ + 4.5SO_4^2 + C_6H_5CH_3 \Rightarrow 7CO_{24} + 4.5H_2S^2 + 4H_2O$ Toluene oxidation / sulfate reduction	-142.86	-597.7	4.7:1
$5H_1O + C_4H_1CH_3 \Rightarrow 2.5CO_{14} + 4.5CH_4$ Toluene oxidation / methanogenesis	-34.08	-142.6	0.78:1 b/

TABLE 4.5 (Continued) COUPLED OXIDATION REACTIONS FOR BTEX COMPOUNDS PUMPHOUSE 75

Intrinsic Remediation TS MacDill Air Force Base, Florida

Coupled Ethylbenzene Oxidation Reactions	ΔG° _r (kcal/mole Ethyl- benzene)	ΔG°, (kJ/mole Ethyl- benzene)	Stoichiometric Mass Ratio of Electron Acceptor to Compound
$10.5O_2 + C_6H_5C_2H_5 \Rightarrow 8CO_{2,g} + 5H_2O$ Ethylbenzene oxidation /aerobic respiration	-1066.13	-4461	3.17:1
8.4 NO ₃ + 8.4 H ⁺ + C ₆ H ₅ C ₂ H ₅ \Rightarrow 8 CO ₂₄ + 9.2 H ₂ O + 4.2 N ₂₄ Ethylbenzene oxidation / denitrification	-1080.76	-4522	4.92:1
$84H^{+} + 42Fe(OH)_{3,a} + C_{0}H_{3}C_{1}H_{3} \Rightarrow 8CO_{2} + 42Fe^{2+} + 110H_{2}O$ Ethylbenzene oxidation/iron reduction	-778.48	-3257	22:12
$10.5 \text{H}^+ + 5.25 \text{SO}_4^2 + C_6 \text{H}_5 C_2 \text{H}_5 \Rightarrow 8 \text{CO}_{14} + 5.25 \text{H}_2 \text{S}^+ + 5 \text{H}_2 \text{O} \text{Eth}$ Ethylbenzene oxidation / sulfate reduction	-166.75	-697.7	4.75:1
$5.5H_{1}O + C_{6}H_{5}C_{2}H_{5} \Rightarrow 2.75CO_{14} + 5.25CH_{4}$ Ethylbenzene oxidation / methanogenesis	-39.83	-166.7	0.79:1 6/

Coupled m-Xylene Oxidation Reactions	ΔG°, (kcal/mole m-xylene)	ΔG° _r (kJ/mole m-xylene)	Stoichiometric Mass Ratio of Electron Acceptor to Compound
$10.5O_2 + C_6H_4(CH_3)_2 \Rightarrow 8CO_{24} + 5H_2O$ m-Xylene oxidation /aerobic respiration	-1063.25	-4448	3.17:1
8.4 NO ₃ + 8.4 H ⁺ + C ₆ H ₄ (CH ₃) ₂ \Rightarrow 8 CO ₂₄ + 9.2 H ₂ O + 4.2 N ₂₄ m-Xylene oxidation / denitrification	-1077.81	-4509	4.92:1
$84H^{+} + 42Fe(OH)_{3,a} + C_{6}H_{4}(CH_{3})_{2} \Rightarrow 8CO_{2} + 42Fe^{2+} + 110H_{2}O$ $m-Xylene oxidation / iron reduction$	-775.61	-3245	22:12
$10.5H^+ + 5.25SO_4^2 + C_6H_4(CH_3)_2 \Rightarrow 8CO_{2a} + 5.25H_2S^a + 5H_1O$ m-Xylene oxidation / sulfate reduction	-163.87	-685.6	4.75:1
$5.5 H_2O + C_4H_4(CH_3)_2 \Rightarrow 2.75 CO_{24} + 5.25 CH_4$ m-Xylene oxidation / methanogenesis	-36.95	-154.6	0.79:1 6/

^w Mass of ferrous iron produced during microbial respiration.

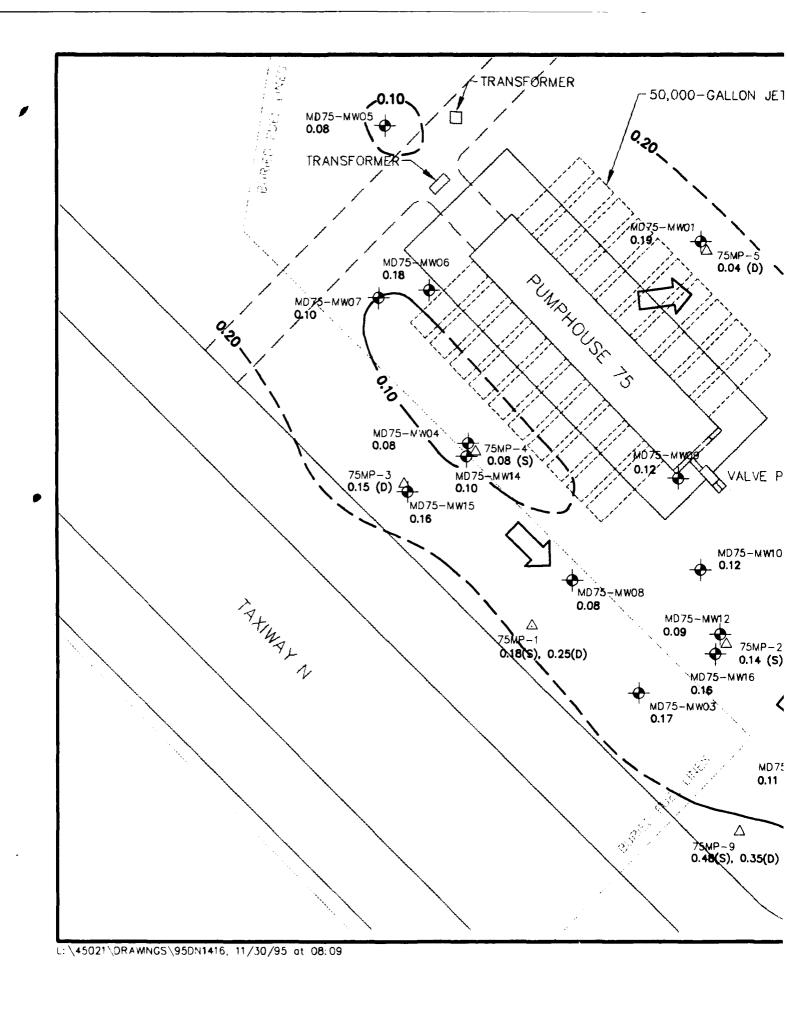
^{b/} Mass of methane produced during microbial respiration.

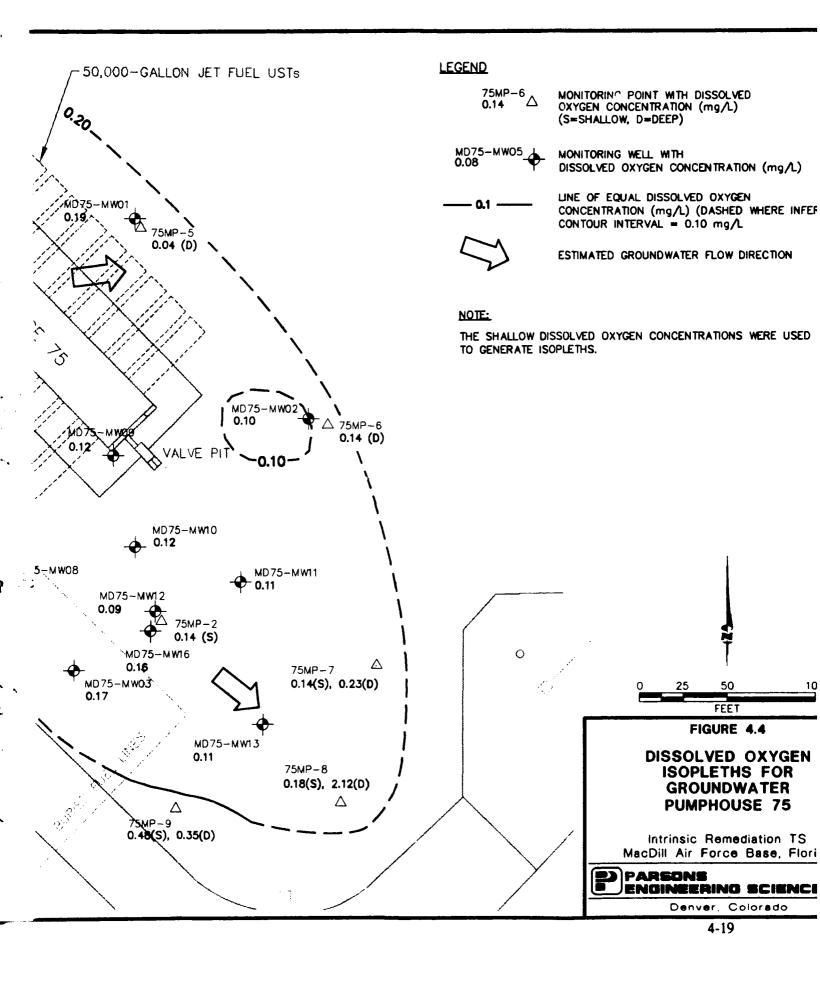
1995 GROUNDWATER GEOCHEMICAL DATA PUMPHOUSE 75 **TABLE 4.6**

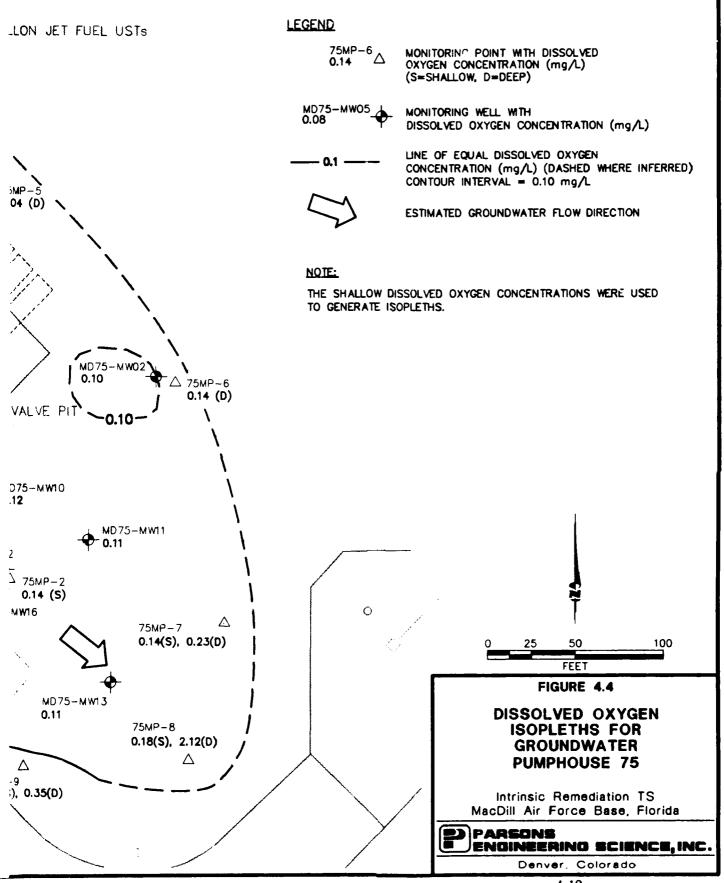
INTRINSIC REMEDIATION TS MACDILL AIR FORCE BASE, FLORIDA

Condensive Congressive Congressive Congressive Congressive Condensive Congressive C		Water			Dissolved	Redox	Total		Ferrous			Total					Carbon	
(1) (1) <th>Sample</th> <th>Temp</th> <th></th> <th>Conductivity</th> <th>Oxygen</th> <th>Potential</th> <th>Alkalinity</th> <th></th> <th>lron</th> <th>Nitrate</th> <th>Nimic</th> <th>Iron</th> <th>Sulfate</th> <th>Manganese</th> <th>Suffide</th> <th>Ammonia</th> <th>Dioxide</th> <th>Methane</th>	Sample	Temp		Conductivity	Oxygen	Potential	Alkalinity		lron	Nitrate	Nimic	Iron	Sulfate	Manganese	Suffide	Ammonia	Dioxide	Methane
131 146 270 018 214 110 134 009 ND ND 012 358 ND 000 113 014 113 014 113 014 113 014 113 014 113 014 113 014 113 014 113 014 113 014 113 014 113 014 113 014 113 014 113 014 014 113 014	Location	១	_	(mɔ/sm)	(mg/L)	(mV) ^e	(mg/L)		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)*	(mg/L)	(mg/L)
21.3 58.6 90 0.25 -35.9 19.5 18.7 18.9 18.1 01 17.7 1 <t< td=""><td>75NP-1S</td><td>22.8</td><td></td><td>270</td><td>1</td><td>21.4</td><td>011</td><td>13.4</td><td>60.0</td><td>£</td><td>£</td><td>0.12</td><td>35.8</td><td>NO.</td><td>0.047</td><td>NA</td><td>¥Z</td><td>٧X</td></t<>	75NP-1S	22.8		270	1	21.4	011	13.4	60.0	£	£	0.12	35.8	NO.	0.047	NA	¥Z	٧X
3.4 1.0 0.14 7.5 1.0 0.14 7.5 1.0 0.14 7.5 1.0 0.14 7.5 1.0 0.14 7.5 1.0 0.14 7.5 1.0 0.14 7.5 1.0 0.14 0.15 1.0 0.14 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.16 0.14 0.15 0.14 0.15 0.14 0.14 0.15 0.14 0.16 0.14	75MP-1D	23.1	5.86	8	0.25	-29.2	15	9.75	1.82	Ð	£	1.85	15.1	0.1	1.77	_	00T>	NA
44 59 61 57 64 7 64 11 78 60 64 11 78 60 61 73 10 73 ND 0.94 ND 0.94 ND 0.95 ND 0.954 0.95 <th< td=""><td>75NP-2S</td><td>22.5</td><td>1.97</td><td>170</td><td>0.14</td><td>-75.9</td><td>70</td><td>13.4</td><td>1.65</td><td>90.0</td><td>£</td><td>1.65</td><td>3.15</td><td>0.1</td><td>4.125</td><td>3</td><td>115</td><td>6.55</td></th<>	75NP-2S	22.5	1.97	170	0.14	-75.9	70	13.4	1.65	90.0	£	1.65	3.15	0.1	4.125	3	115	6.55
3.4 3.9 0.13 7.3 1.0 NA NA NA 0.9 NA NA 0.9 NA	75NP-3D	24.6	4.74	80	0.15	-7.5	10	5.7	0.47	Q	Ð	0.44	11.5	æ	0.443	0.2	<100	1.777
14 510 610	75NP-3D dup	24.6	4.74	50	0.15	-7.5	10	ΝA	0.93	NA	NA	0.97	NA	Ð.	0.554I	0.21	<100	0.036
2.13 6.14 200 0.04 -103.2 100 10.3 2.94 ND ND 2.13 6.14 ND 0.14 6.04 90 0.14 -56.0 10.3 2.24 ND ND 0.13 2.14 ND 0.14 -6.04 90 0.14 -56.0 180 16.6 0.09 ND 0.09 2.14 ND 0.09 2.14 ND 0.09	75NP-4S	23.4	5.15	880	80.0	-102.1	760	24.8	20.9	690'0	0.125	31.5	1.82	Ð	0.303	7	225	14.469
2.51 560 99 0.14 -560 35 122 2.54 ND ND 2.25 2.16 ND 0.04 -560 3.02 1.02 0.04 ND ND 0.05 2.16 ND 3.02 0.16 ND 1.05 ND 1.05 ND ND 1.05 ND ND 1.05 ND	75NP-5D	24.3	6.43	200	10.0	-103.2	100	10.3	2.98	S	Ð	3.01	7.41	Ð	0.865	2	<100	7.361
2.3.7 4.30 0.14 -1664 180 16 0.09 ND ND 0.08 2.34 ND 3.02 1.1 0.10 2.3.7 6.14 4.30 0.14 -1664 1.80 1.80 ND ND 0.08 ND 0.08 0.09 ND 0.09 0.09	75NP-6D	1.52	5.60	06	0.14	-56.0	35	12.2	2.54	QN	ON.	2.52	2.16	ON.	0.39	0.3	180	8.613
131 140 0.14 -1664 200 NA 0.12 NA 0.16 NA 0.16 NA 0.19 NA 0.19 NA 0.19 NA 0.16 1.64 0.01 1.15 0.02 0.02 0.02 46.2 0.11 0.15 0.00 0.01 0.02	75AP-7S	23.7	6.74	430	0.14	-169.4	180	91	0.09	Ę	R	0.08	23.4	Ω	3.02	1	<100	NA
2.48 6.45 2.00 0.23 -4.33 115 2.84 3.97 ND ND 405 46.2 0.1 1.55 0.0 1.0 4.62 0.1 1.55 0.0 1.0 0.0 2.84 0.0 1.5 ND ND 0.0 2.84 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0 0.0 <	75NP-7S dup	23.7	6.74	430	0.14	-169.4	200	N.	0.12	NA	NA	0.16	NA	ΩN	3.175	1	٧V	NA
243 7,00 360 0.18 -3.2 140 12.5 0.03 0.99 ND 0.09 28.4 0.11 0.045 ND 0.09 ND 0.09 ND 0.09 ND 0.09 ND 0.01 ND ND ND 0.01 ND ND 0.01 ND ND 0.02 ND ND 0.02 ND ND 0.02 ND ND <th< td=""><td>75MP-7D</td><td>24.8</td><td>6.45</td><td>220</td><td>0.23</td><td>-43.3</td><td>15</td><td>28.4</td><td>3.97</td><td>ΩN</td><td>æ</td><td>1.05</td><td>16.2</td><td>0.1</td><td>1.55</td><td>9.0</td><td>001</td><td>0.437</td></th<>	75MP-7D	24.8	6.45	220	0.23	-43.3	15	28.4	3.97	ΩN	æ	1.05	16.2	0.1	1.55	9.0	001	0.437
NA NA NA NA NA NA NA NA NA 125 NA 0973 ND NA NA NA NA NA NA NA NA NA 125 NA 0973 ND 0.28 ND 0.18 ND 0.18 ND 0.24 ND <td>75NP-8S</td> <td>24.3</td> <td>7.20</td> <td>360</td> <td>0.18</td> <td>-3.2</td> <td>140</td> <td>12.5</td> <td>0.03</td> <td>66.0</td> <td>Ð</td> <td>60.0</td> <td>28.4</td> <td>0.1</td> <td>0.045</td> <td>QN.</td> <td><100</td> <td>0.042</td>	75NP-8S	24.3	7.20	360	0.18	-3.2	140	12.5	0.03	66.0	Ð	60.0	28.4	0.1	0.045	QN.	<100	0.042
305 706 709 200 212 -88.2 160 12.6 6.9 0.06 ND 9.01 9.01 ND 0.01 0.01 0.00 0.01 0.02 0.01 0.02 0.01 0.02 0.03	75NP-8S dup	ĸZ	۲Z	۲X	Ϋ́N	ΥN	KN	12.5	NA	0.973	Ð	N.A	28.5	NA	NA	AN	ΥN	0.041
249 768 370 6.8 200 8.2 0.19 ND 0.24 0.02 ND 0.03 0.03 ND 0.10 0.10 ND 0.01 ND 0.01 ND 0.01 ND 0.01 ND 0.01 ND 0.01 0.02 0.02 0.00 0.02 0.00 0.02 0.00 0.02 0.00 0	75NP-8D	30.5	7.09	290	2.12	-83.2	160	12.6	6.9	90.0	Ð	9.05	9.21	ΩN	0.182	9.0	00 l>	0.038
214 716 370 0.48 -68 200 NA 0.15 NA 0.15 NA 0.15 NA 0.15 NA 0.15 NA 0.10 6.02 1.1 ND 0.298 1.21 ND 0.298 0.03 4.00 7.00 1.00 6.02 0.02 0.03 1.1 ND 0.034 ND 0.038 0.03 0.03 0.00 0.03 0.00 0.03 0.03 0.03 NA 0.03 NA 0.04 NA 0.04 NA 0.04 NA 0.04 NA 0.05 0.04 NA 0.03 NA 0.04 NA 0.04 NA 0.04 NA 0.05 0.04 0.04 0.04	75NP-9S	24.9	7.68	370	81:0	8.9	200	8.2	0.19	Q.	QV	0.24	20.2	QN.	0.3181	QX	001>	0.132
25, 5, 60 70 0.35 -1.3 20 4.8 2.04 ND 2.05 1.1 ND 0.29 0.1 ND 2.04 1.0 0.03 ND 2.04 1.0 0.03 ND 0.00 ND 0.03 ND 0.00 0.00 ND ND 0.00 ND 0.00 ND <	75NP-95 dup	24.9	7.68	370	0.48	-6.8	200	N.A	0.15	NA	N.A	0.15	NA	۲N	0.248	QN	001>	NA
234 702 180 0.19 35.0 100 62.7 21.2 ND D.94 15.2 ND 0.034 ND 100 60.8 100 6.00 100 ND ND ND 10.00 80.8 10.00 ND 10.00 ND 0.00 0.00 ND 0.00	75NP-9D	26.7	<u>د</u>	70	0.35	-1.3	20	4.8	2.04	£	£	2.05	12.1	ΩN	0.298	0.3	<100	0.072
238 663 220 0.10 -6.0 80 126 0.08 0.08 0.58 ND 0.024 ND 0.08 25.8 ND 0.012 ND 0.10 23.8 4.97 220 0.10 -6.0 80 NA 0.03 NA 0.01 2.03 ND 0.01 0.00 ND 0.00 <	MD75-MW01	23.4	7.02	180	0.19	35.0	100	6.27	2.12	Ð	5	2.94	15.2	ON	0.034	0.1	<100	NA
23.8 6.63 220 0.10 -6.0 80 NA 0.03 NA 0.06 NA ND 0.01 ND 0.01 ND 0.01 ND 0.01 ND 0.03 NA ND 0.01 ND 0.009 ND 0.009 ND 0.009 ND 0.009 ND 0.009 ND 0.009 0.01 ND 0.01 ND 0.009 ND 0.009 ND 0.009 0.01 0.00 ND 0.01 ND 0.01 ND 0.009 ND 0.009 ND 0.01 ND ND 0.01 ND 0.01 ND ND ND 0.01 ND ND ND ND 0.01 ND	MD75-MW02	23.8	6.63	220	0.10	9.0	08	12.6	0.02	0.08	£	0.08	25.8	Q.	0.024	<u>Q</u>	<100	0.271
23.9 4.97 220 0.17 -18.4 70 10 0.03 NA 0.14 22.8 ND 0.099 ND NA 23.9 4.97 220 0.17 -18.4 80 NA 0.03 NA 0.01 NA NA 0.01 ND 0.019 ND 0.019 ND 0.019 ND 0.019 ND 0.010 ND 0.010 ND 0.010 ND 0.029 ND 0.010 ND 0.029 ND 0.010 ND 0.029 ND 0.010 ND 0.010 ND 0.010 ND 0.010 ND 0.029 ND 0.010	MD75 MW 02 dup	23.8	6.63	220	0.10	9	08	Ϋ́Z	0.03	¥Z	Y.N	90.0	Y Y	Ð	0.012	S	<100	N.A
23 9 457 220 0.17 -184 80 NA 0.03 NA 0.11 NA ND 0.01 ND 0.019 ND NA 23.7 5.60 690 0.08 -71.2 380 168 5.25 0.082 ND 6.157 ND 0.019 ND 0.019 ND 0.010 0.010 -88.4 215 22.2 0.15 ND 0.15 27.8 0.11 ND 0.010 ND 0.010 ND 0.010 ND 0.010 ND 0.010 0.010 1.44 0.77 0.07 ND 0.72 0.72 ND 0.72 0.72 ND 0.010 0.02 ND 0.010 0.02 ND 0.010 0.02 ND 0.010 0.010 ND <t< td=""><td>NID75-NIW03</td><td>1</td><td>1.97</td><td>220</td><td>0.17</td><td>-18.4</td><td>70</td><td>2</td><td>0.03</td><td>£</td><td>£</td><td>0.14</td><td>22.8</td><td>Ð</td><td>0.009</td><td>£</td><td>N.A</td><td>0.038</td></t<>	NID75-NIW03	1	1.97	220	0.17	-18.4	70	2	0.03	£	£	0.14	22.8	Ð	0.009	£	N.A	0.038
23.7 5.60 690 0.08 -71.2 380 16.8 5.25 0.082 ND 5.5 1.91 ND 0.074 8 162 23.7 5.60 690 0.08 -71.2 380 16 4.59 0.061 ND ND 0.18 1.57 ND 0.02 8 1.00 <td< td=""><td>AID75-MW03 dup</td><td></td><td>4.97</td><td>220</td><td>0.17</td><td>+ 81-</td><td>28</td><td>Ϋ́</td><td>0.03</td><td>ΥN</td><td>4.N</td><td>0.11</td><td>NA</td><td>Ð</td><td>0.019</td><td>Ð.</td><td>N.A</td><td>N.A</td></td<>	AID75-MW03 dup		4.97	220	0.17	+ 81-	28	Ϋ́	0.03	ΥN	4.N	0.11	NA	Ð	0.019	Ð.	N.A	N.A
23.7 5.60 690 0.08 -71.2 380 16 4.95 0.061 ND 6 1.57 ND 0.029 8 NA 23.7 6.50 340 0.08 -15.4 140 12.3 0.02 ND 0.18 27.8 0.1 ND 0.10 ND 0.10 ND 0.10 0.13 4.0 1.2 0.15 ND 0.13 2.06 0.1 0.13 0.0 ND 0.13 0.0 ND 0.10 ND 0.13 0.0 0.0 0.13 0.10 0.0 0.1	MD75-MW04	23.7	& 36	069	0.08	-71.2	380	16.8	5.25	0.082	Ð	5.5	16.1	ďΝ	0.074	8	162	1.89
23.7 6.90 340 0.08 -15.4 140 12.3 0.02 ND ND 6.18 27.8 0.1 ND ND 23.4 6.57 310 0.18 8.2 120 1.37 0.03 0.162 ND 0.15 2.66 0.1 0.022 ND NA 23.4 6.57 310 0.18 2.22 0.15 0.15 0.15 0.16 0.15 0.16 0.15 0.16 0.15 0.16 0.16 0.15 0.16 0.16 0.12 0.15 0.16 0.12 0.10 0.18 0.1 0.14 0.17 0.09 ND 0.09 ND 0.16 0.14 0.00	MD75-MW04 dup	23.7	S.65	069	0.08	-71.2	380	2	4.95	0.061	g	9	1.57	Ð	0.029	8	NA.	NA
23.4 6.57 310 0.18 8.2 120 7.37 0.03 0.162 ND 0.15 266 0.1 0.022 ND NA 23.0 NA 520 0.10 -88.4 215.2 0.15 ND 0.13 496 ND 0.13 0.46 NA -100 23.8 7.14 290 0.12 -120.8 160 NA 2.07 ND 0.72 1.22 0.2 1.44 4.00 0.02 1.44 4.00 0.07 1.02 0.02 1.44 0.07 ND 0.02 1.02 0.00 1.00 <td>MID75-MW05</td> <td>23.7</td> <td>8.8</td> <td>340</td> <td>80.0</td> <td>+S1-</td> <td>9</td> <td>12.3</td> <td>0.02</td> <td>£</td> <td>g</td> <td>0.18</td> <td>27.8</td> <td>0.1</td> <td>Ω</td> <td>Ð</td> <td><100</td> <td>0.035</td>	MID75-MW05	23.7	8.8	340	80.0	+S1-	9	12.3	0.02	£	g	0.18	27.8	0.1	Ω	Ð	<100	0.035
23 0 NA 520 0.10 -88.4 215 2.2.2 0.15 ND ND 0.13 49.6 ND 0.387 0.4 <100 23.8 4.83 380 0.08 -95.7 200 14.4 0.77 0.07 1.22 0.2 1.64 4 200 22.8 7.14 290 0.12 -120.8 160 NA 2.07 NA 2.05 1.46 ND 0.73 1.25 0.0 1.64 4 2.00 22.8 7.14 290 0.12 -120.8 160 NA 2.07 NA 2.05 NA 0.13 0.14 4 4 <100	ND75-NIW06	23.4	6.57	310	0.18	8.2	120	7.37	0.03	0.162	g	0.15	26.6	0.1	0.022	Ð.	N.A	2.466
23.8 4.83 380 0.08 -95.7 200 14.4 0.77 0.07 ND 0.72 1.22 0.2 1.64 4 200 22.8 7.14 290 0.12 -120.8 160 8.21 2.11 0.069 ND 2.05 1.46 ND 0.705 4 <100	NED75-NIW07	23.0	Ϋ́Z	520	0.10	-88.4	215	22.2	0.15	g	g	0.13	49.6	S	0.387	0.4	<100	0.641
22.8 7.14 290 0.12 -120.8 160 8.21 2.11 0.069 ND 2.05 1.46 ND 0.705 4 <100 22.8 7.14 290 0.12 -120.8 160 NA 2.07 NA NA 2.06 NA 0.13 1.03 0.1 0.575 4 <100	NID75-NIW08	23.8	4.83	380	0.08	-95.7	82	=	0.77	0.07	見	0.72	122	0.2	19:	7	500	8.962
22.8 7.14 290 0.12 -120.8 160 NA 2.07 NA NA 2.06 NA 0.13 0.11 0.575 4 <100 24.0 6.95 24.0 0.12 -88.4 120 0.47 ND 0.43 10.3 0.1 0.446 1 0.00 1 0.1 -2.09 0.01 0.73 ND ND 0.79 6.58 ND 0.79 6.58 ND 0.79 0.79 ND 0.79 0.79 ND ND 0.79 ND ND 0.70 ND ND 0.79 ND 0.79 ND 0.79 ND 0.79 0.79 ND 0.79 0.79 ND 0.79 ND	ND75-NIW09		7.14	290	0.12	-120.8	991	8.21	7.11	0.069	g	2.05	1.46	S O	0.70\$	7	<100	2.245
24.0 655 240 0.12 -88 4 120 9.01 0.43 ND 0.43 10.3 0.1 0.446 1 <100 23.7 6.76 310 0.01 -73.9 6.73 ND 0.79 6.58 ND 0.516 1 <100	NID75-NIW09 dup		7.14	280	0.12	-120.8	091	Y.N	2.07	Ϋ́	ž	5.06	ΝA	0.1	0.575	4	<100	NA
23.7 6.76 310 0.11 -73.9 6.0 20.8 0.73 ND ND 0.79 65.8 ND 0.516 1 <100 22.8 4.61 130 0.09 -98.2 55 11 0.61 ND ND 0.58 11.3 ND 0.266 3 100 24.4 7.29 410 0.01 -2.28 160 14.9 0.09 ND 0.18 30.7 ND 0.03 ND NA 24.9 5.05 540 0.10 -82.8 280 13.5 5.25 0.072 ND 5.65 192 ND 0.403 N 193 22.9 NA 330 0.16 -2.06 125 156 0.1 ND ND 0.29 40.2 ND 0.02 0.1 <100	NID75-NIW10	24.0	6.95	240	0.12	¥.88	120	10.6	0.47	Ę	Ð	0.43	10.3	0.1	0.446	1	<100	5.394
228 4.6 130 0.09 -98.2 55 11 0.61 ND ND 0.58 11.3 ND 0.266 3 100 24.4 7.29 410 0.01 -2.28 160 14.9 0.09 ND ND 0.18 30.7 ND 0.03 ND NA NA 24.9 5.05 540 0.10 -82.8 280 13.5 5.25 0.072 ND 5.65 1.92 ND 0.403 2 195 22.9 NA 330 0.16 -2.06 125 156 0.1 ND ND 0.29 40.2 ND 0.02 0.1 <100	ND75-NW11	23.7	6.76	310	0.11	-73.9	જ	20.8	0.73	£	£	0.79	65.8	Ð	0.516	1	<100	0.986
244 7.29 410 0.11 -2.28 160 14.9 0.09 ND ND 0.18 30.7 ND 0.033 ND NA 24.9 5.05 54.0 5.06 13.5 5.25 0.072 ND 5.65 1.92 ND 0.403 2 195 22.9 NA 33.0 0.16 -2.06 125 156 0.1 ND ND 0.29 40.2 ND 0.02 0.1 <100	ND75-NW12	22.8	19:4	130	60.0	-98.2	25	=	19.0	£	£	0.58	E]	£	0.266	3	20	7.31
249 505 540 0.10 -82.8 280 13.5 5.25 0.072 ND 5.65 1.92 ND 0.403 2 195 22.9 NA 330 0.16 -20.6 125 156 0.1 ND ND 0.29 40.2 ND 0.02 0.1 <100	AID75-MW13	24.4	7.29	410	0.11	-22.8	09	6.4	0.0	g	£	0.18	30.7	Ð	0.033	Ð	NA	1.227
22.9 NA 330 0.16 -20.6 125 15.6 0.1 ND ND ND 0.29 40.2 ND 0.07 0.175 0.1 <100 23.4 5.91 410 0.16 -9.9 240 9.54 8.4 ND ND 9.95 1.23 0.1 0.175 1 132	ND75-NfW14	24.9	-	240	0.10	-82.8	280	13.5	\$2.2	0.072	g	5.65	1.92	Ð	0.403	7	195	15.439
23.4 559 410 0.16 -9.9 240 9.54 8.4 ND ND 9.95 1.23 0.1 0.175 1 132	MD75-NfW15	22.9	-	330	0.16	-20.6	123	15.6	-	£	£	0.29	2 07	£	0.02	0.1	2100 √	0.05
	NID75-NIW16	23.4	5.91	01	0.16	-9.9	240	9.54	**	£	£	9.95	1.23	0.1	0.175	-	132	6:039

a pu/cm = microsiemens per centimeter.
b/ mg.L = milligrams per liter.
c/ mV = millivolts.
d/ ND = compound not detected.
e/ NA = compound not analyzed for.
f/ I = potential turbidity interference.
Note: See Table 2.2 for analysis methods.







characterized by substantially elevated BTEX concentrations (greater than 100 µg/L), DO concentrations are generally below 0.2 mg/L, and are as low as 0.08 mg/L (at 75MP-4S, MD75-MW04, MD75-MW05, and MD75-MW08). DO levels measured outside or on the margin of the plume range from 0.04 mg/L to 2.12 mg/L. The data do not clearly indicate the magnitude of background DO concentrations; therefore, the assimilative capacity calculations contained in the following paragraphs are speculative. In the two monitoring well/point clusters (MP-4S/MW04/MW14 and MP-2S/MW12/MW16), the DO values are generally similar at all depths. Therefore, this parameter does not shed any light on the validity of the BTEX detections in the deep wells.

The stoichiometry of BTEX mineralization to carbon dioxide and water caused by aerobic microbial biodegradation is presented in Table 4.5. The average mass ratio of oxygen to total BTEX is approximately 3.14 to 1. This translates to the mineralization of approximately 0.32 mg of BTEX for every 1.0 mg of DO consumed. With a maximum observed shallow groundwater DO concentration of approximately 0.48 mg/L, and a minimum observed DO concentration within the plume of 0.08 mg/L, the shallow groundwater at this site may have the capacity to assimilate a maximum of 0.13 mg/L (130 μ g/L) of total BTEX through aerobic biodegradation. This may be a conservative estimate of the assimilative capacity of DO because microbial cell mass production was not taken into account by the stoichiometry presented in Table 4.5.

When cell mass production is accounted for, the mineralization of benzene to carbon dioxide and water is given by:

$$C_6H_6 + 2.5O_2 + HCO_3 + NH_4 \rightarrow C_5H_7O_2N + 2CO_2 + 2H_2O_3$$

This equation indicates that 5.0 fewer moles of DO are required to mineralize 1 mole of benzene when cell mass production is taken into account. On a mass basis, the ratio of DO to benzene is given by:

Benzene
$$6(12) + 6(1) = 78 \text{ gm}$$

Oxygen $2.5(32) = 80 \text{ gm}$

Mass Ratio of Oxygen to Benzene = 80/78 = 1.03:1

On the basis of these stoichiometric relationships, 1.03 mg of oxygen is required to mineralize 1 mg of benzene. Similar calculations can be made for toluene, ethylbenzene, and the xylenes. Based on these calculations, approximately 0.97 mg of BTEX is mineralized to carbon dioxide and water for every 1.0 mg of DO consumed. With a maximum background DO concentration of approximately 0.48 mg/L and a minimum DO concentration within the plume of 0.08 mg/L, the shallow groundwater at this site may have the capacity to assimilate up to 0.39 mg/L (390 μ g/L) of total BTEX if microbial cell mass production is taken into account.

4.3.2.2 Nitrate/Nitrite

Concentrations of nitrate and nitrite were measured at groundwater monitoring wells and monitoring points in March 1995 (Table 4.6). Nitrite was detected only in the

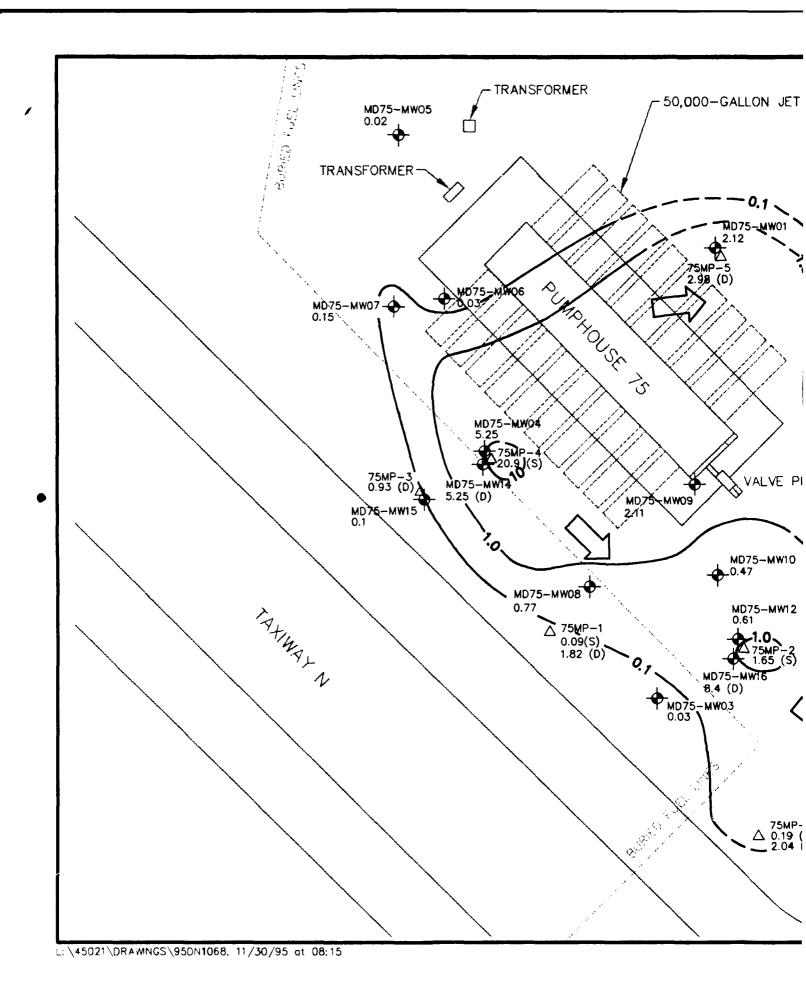
sample from monitoring point 75MP-4S, while nitrate was detected in 12 samples from 10 wells at concentrations ranging from 0.06 mg/L to 0.99 mg/L (Table 4.6). Nitrate concentrations in areas characterized by the presence of elevated BTEX concentrations were less than 0.1 mg/L. The highest concentration of nitrate was detected in monitoring point 75MP-8S, which had no detectable BTEX concentration. However, nitrate concentrations do not appear to be significantly depleted in areas containing elevated dissolved BTEX concentrations, as evidenced by the lack of nitrate detections in more outlying areas. Conversely, the majority of nitrate detections were located within the BTEX plume area. Therefore, the nitrate data suggest that denitrification is not a significant process contributing to BTEX biodegradation at this site.

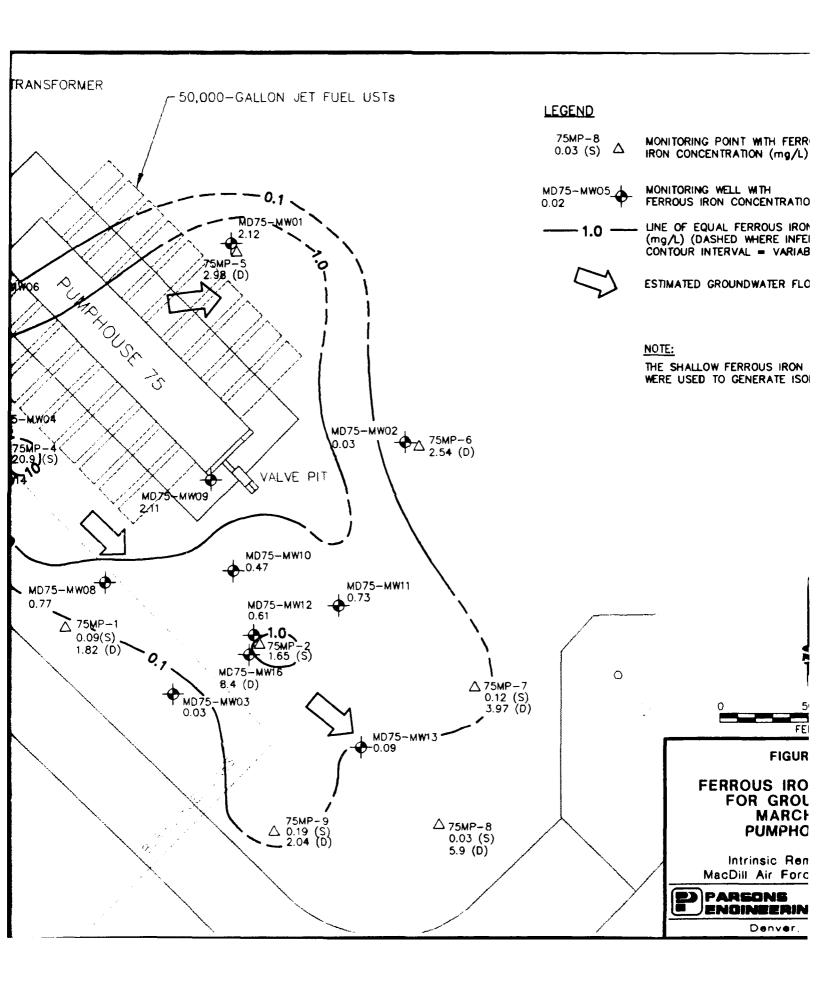
The stoichiometry of BTEX mineralization to carbon dioxide, water, and nitrogen caused by denitrification (in the absence of microbial cell production) is presented in Table 4.5. The average mass ratio of nitrate to total BTEX is approximately 4.9 to 1. This translates to the mineralization of approximately 0.20 mg of BTEX for every 1.0 mg of nitrate consumed. With a maximum observed nitrate concentration of 0.99 mg/L, the shallow groundwater at this site may have the capacity to assimilate 0.20 mg/L (200 $\mu g/L$) of total BTEX during denitrification. This may be a conservative estimate of the assimilative capacity of nitrate because microbial cell mass production has not been taken into account by the stoichiometry shown above. However, the lack of clear correspondence between depleted nitrate concentrations and elevated BTEX concentrations suggest that denitrification is not a primary biodegradation mechanism at this site.

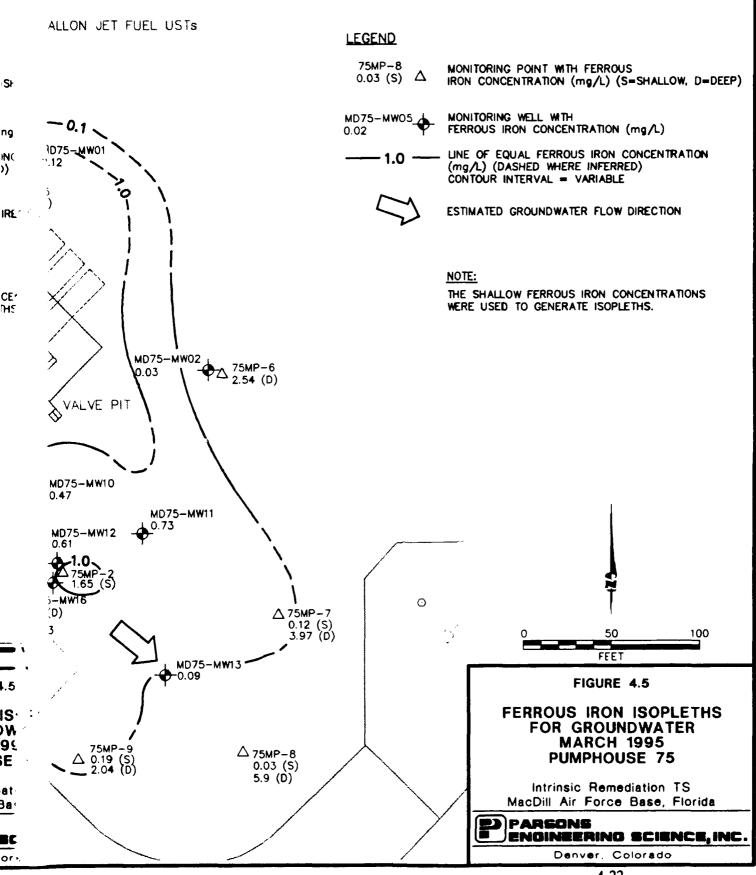
4.3.2.3 Ferrous Iron

Figure 4.5 is an isopleth map showing the distribution of ferrous iron in groundwater in the upper portion of the saturated zone, and Table 4.6 summarizes ferrous iron concentrations. Comparison of Figure 4.3 and 4.5 indicates that ferrous iron is being produced in the area of the BTEX plume via the reduction of ferric iron during anaerobic biodegradation of BTEX compounds. Ferrous iron concentrations detected within the area bounded by the 100-µg/L BTEX isopleth (Figure 4.3) range from 0.61 mg/L at monitoring well MD75-MW12 to 20.9 mg/L at monitoring point 75MP-4S. Background levels of ferrous iron, measured in shallow wells that are hydraulically upgradient or cross-gradient from the BTEX plume, ranged from 0.02 mg/L at MD75-MW05 to 0.15 mg/L at MD75-MW07. In well cluster MP-4S/MW04/MW14, the highest ferrous iron concentration was detected in MP-4S, which is screened in the top 5 feet of the saturated zone. Conversely, the deep well at cluster MP-2S/MW12/MW16 had the highest ferrous iron concentration. remaining well clusters, the deeper sample had the highest ferrous iron concentration. even where the shallow sample contained the highest BTEX concentration. Therefore, the measured concentrations of this parameter do not provide a consistent indication of the co-occurrence of iron reduction and BTEX contamination with depth in the shallow aquifer.

The stoichiometry of BTEX oxidation to carbon dioxide, ferrous iron, and water by iron reduction through anaerobic microbial biodegradation is presented in Table 4.5. On average, 37.5 moles of ferric iron hydroxide are required to metabolize one mole of total BTEX. Conversely, an average of 37.5 moles of ferrous iron are produced for







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each mole of total BTEX consumed. On a mass basis, this translates to approximately 21.8 mg ferrous iron produced for each 1 mg of total BTEX metabolized.

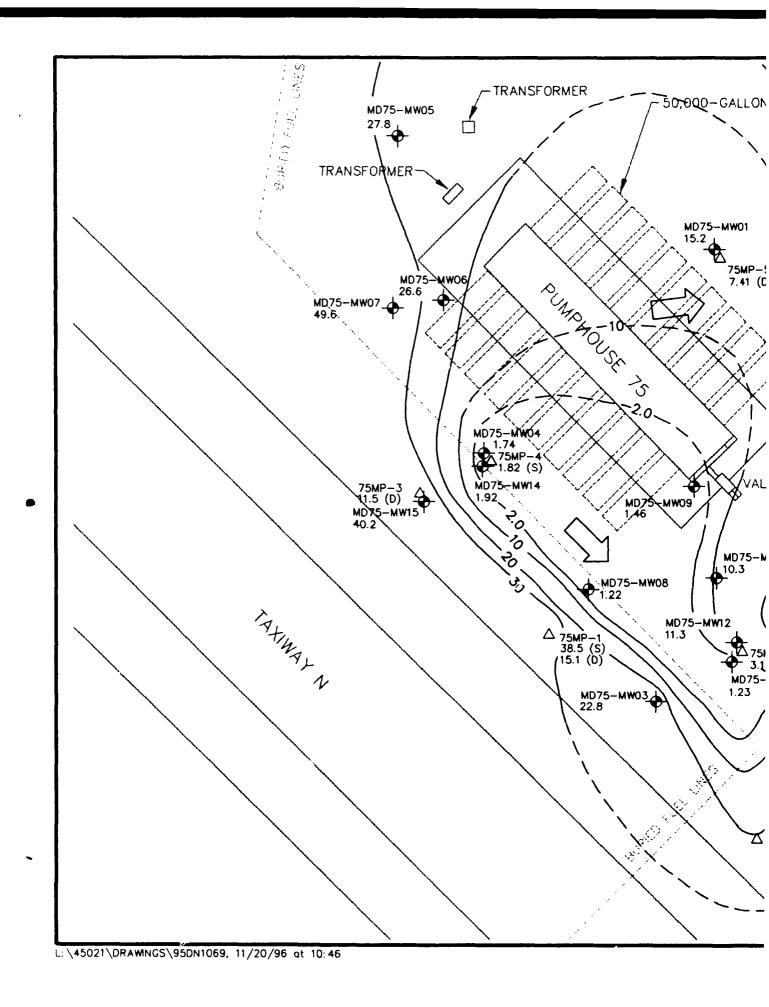
The highest measured Fe^{2+} concentration was 20.9 mg/L, measured at monitoring point 75MP-4S. Assuming an average background ferrous iron concentration of 0.1 mg/L, this suggests that the shallow groundwater at this site has the capacity to assimilate 0.95 mg/L (950 μ g/L) of total BTEX during iron reduction. This may be a conservative estimate of the assimilative capacity of iron because microbial cell mass production has not been taken into account by the stoichiometry shown in Table 4.5. In addition, this calculation is based on observed ferrous iron concentrations and not on the amount of ferric hydroxide available in the aquifer. Therefore, iron assimilative capacity could be much higher.

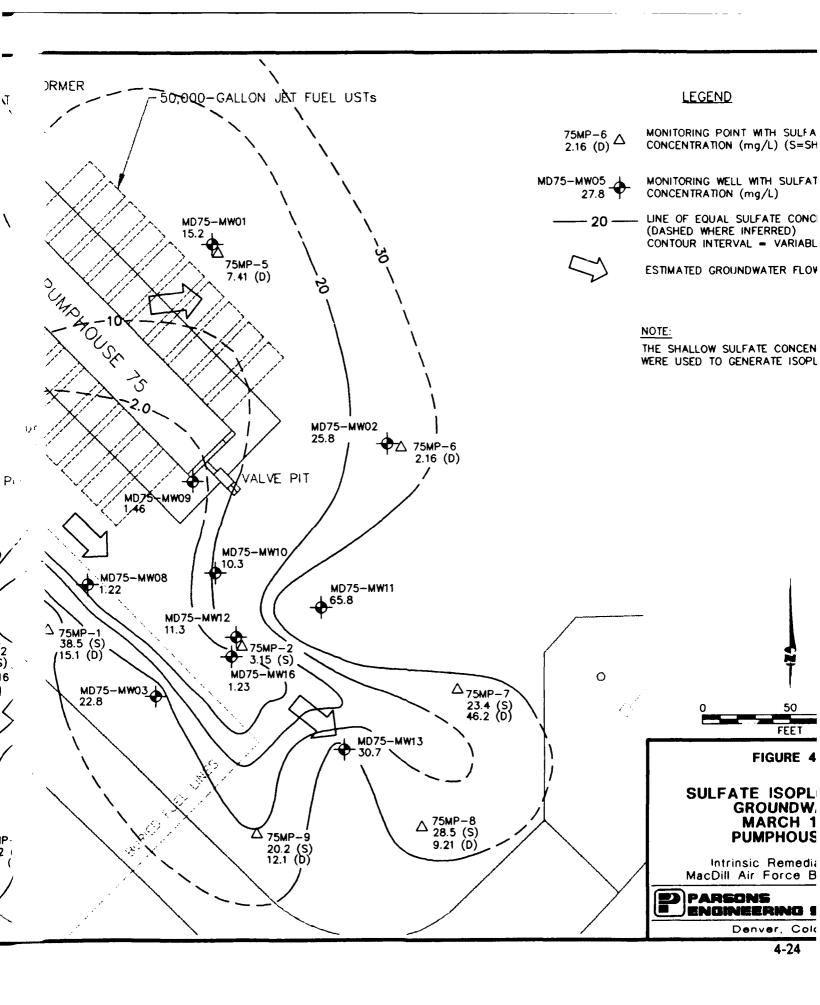
Recent evidence suggests that the reduction of ferric iron to ferrous iron cannot proceed at all without microbial mediation (Lovley and Phillips, 1988; Lovley et al., 1991; Chapelle, 1993). None of the common organic compounds found in low-temperature, neutral, reducing groundwater could reduce ferric oxyhydroxides to ferrous iron under sterile laboratory conditions (Lovley et al., 1991). This means that the reduction of ferric iron requires microbial mediation by microorganisms with the appropriate enzymatic capabilities. Because the reduction of ferric iron cannot proceed without microbial intervention, the elevated concentrations of ferrous iron that were measured in the contaminated groundwater at the site are very strong indicators of microbial activity.

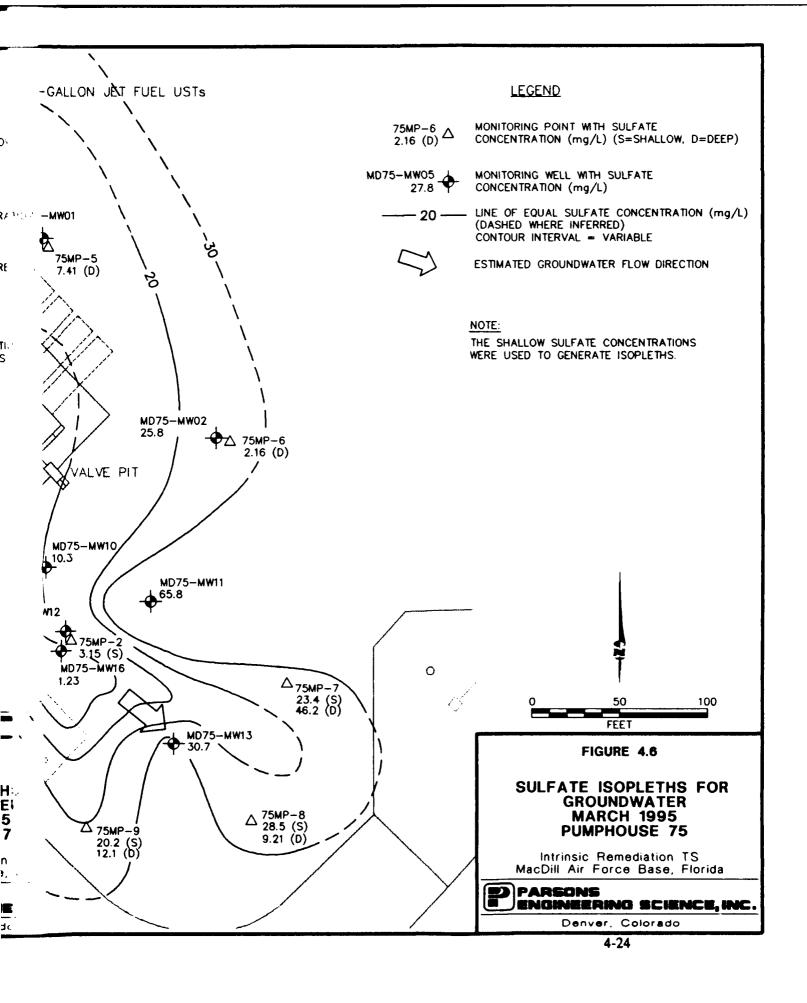
4.3.2.4 Sulfate

Sulfate concentrations in shallow groundwater at the site ranged from 1.22 mg/L to 65.8 mg/L. Figure 4.6 is an isopleth map showing the distribution of sulfate in shallow groundwater in March 1995. Comparison of Figures 4.3 and 4.6 shows graphically that areas with elevated total BTEX concentrations have depleted sulfate concentrations. This is a strong indication that anaerobic biodegradation of BTEX compounds is occurring at the site through the microbially mediated process of sulfate reduction. In well cluster MP-4S/MW04/MW14, sulfate concentrations are consistently low at all depth intervals. At cluster MP-2S/MW12/MW16 however, sulfate concentrations are lowest (and BTEX concentrations are highest) in the deepest well, indicating that sulfate reduction is most prevalent deeper in the aquifer at this location. At most of the remaining monitoring well/point clusters, sulfate concentrations were lowest in the deeper interval, regardless of the distribution of dissolved BTEX concentrations. At 75MP-7S/7D however, sulfate concentrations were most elevated in the deep sample.

The stoichiometry of BTEX mineralization to carbon dioxide, sulfur, and water by sulfate reduction through anaerobic microbial biodegradation is presented in Table 4.5. The average mass ratio of sulfate to total BTEX is approximately 4.7 to 1. This translates to the mineralization of approximately 0.21 mg of total BTEX for every 1.0 mg of sulfate consumed.







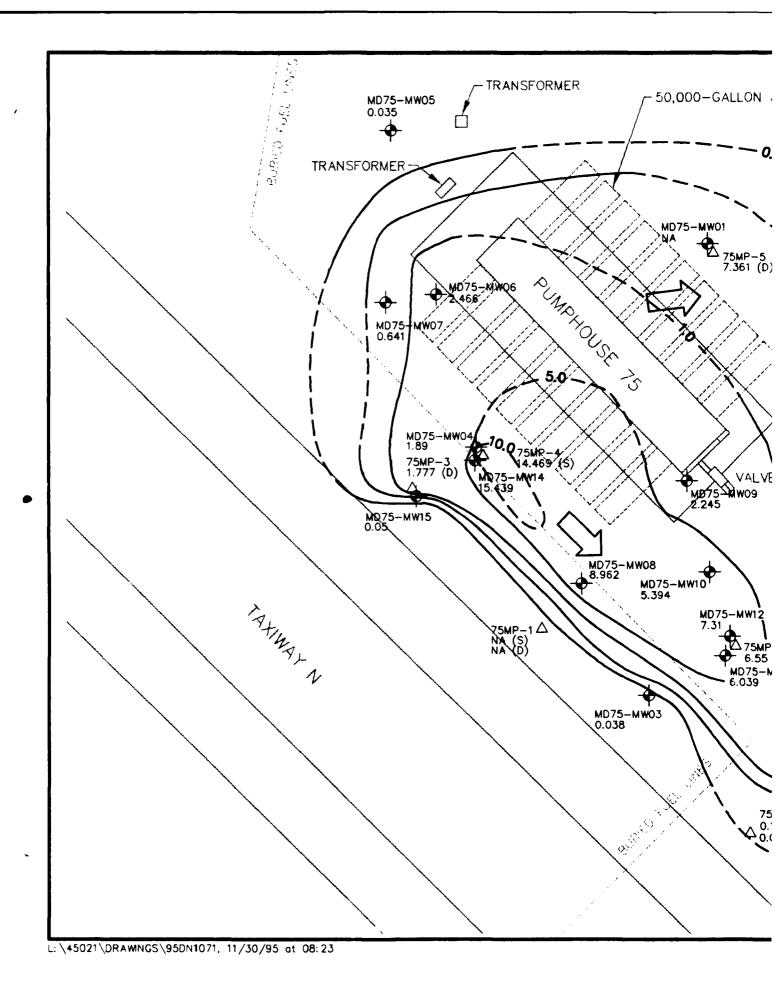
Shallow sulfate concentrations at five background locations upgradient or crossgradient from the BTEX plunie ranged from 22.8 mg/L to 65.8 mg/L and averaged 33.4 mg/L (at MD75-MW05, MD75-MW07, MD75-MW06, MD75-MW15, and MD75-MW03). Assuming a conservative average background sulfate concentration of 25 mg/L, the shallow groundwater at this site has the capacity to assimilate approximately 5.25 mg/L (5,250 μ g/L) of total BTEX during sulfate reduction. This may be a conservative estimate of the assimilative capacity of sulfate in the groundwater because microbial cell mass production has not been taken into account by the stoichiometry presented in Table 4.5.

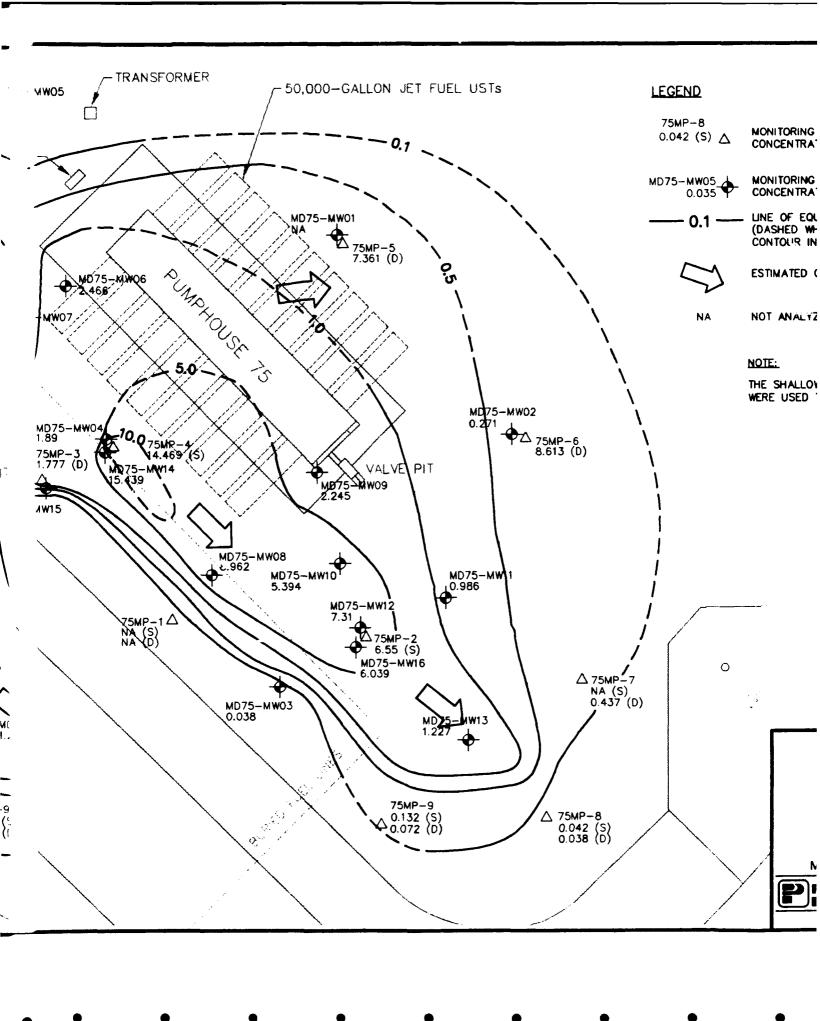
4.3.2.5 Methane

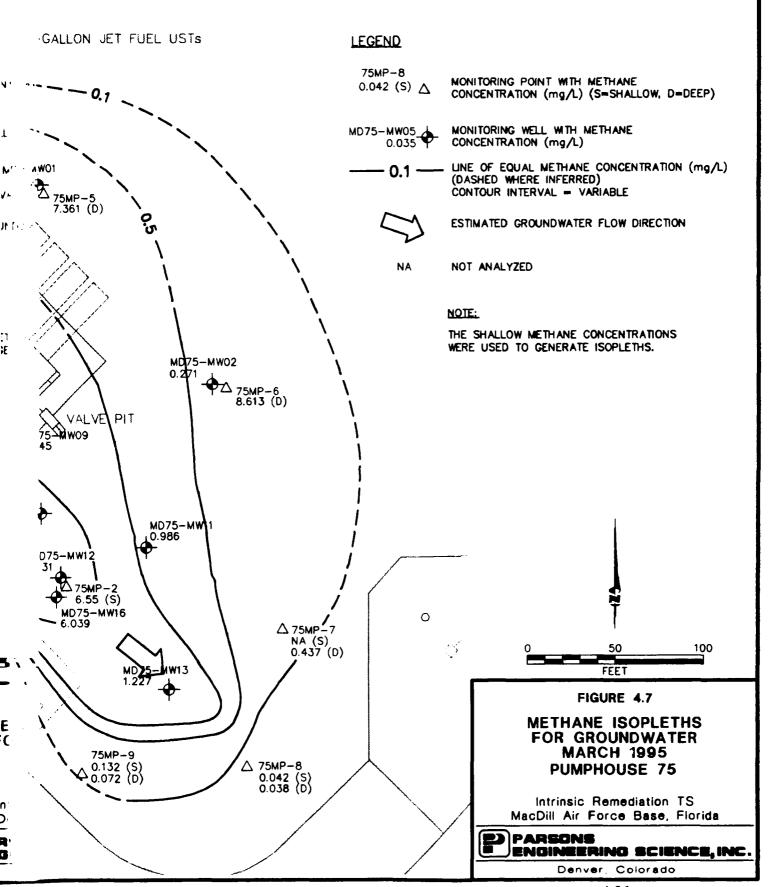
Figure 4.7 is an isopleth map showing the distribution of methane in groundwater in the shallow aquifer. Comparison of Figures 4.3 and 4.7 shows graphically that areas with elevated total BTEX concentrations correlate with elevated methane concentrations. This is a strong indication that anaerobic biodegradation of the BTEX compounds by methanogenesis is occurring at the site.

Methane concentrations detected in shallow groundwater ranged from 0.035 mg/L to 14.47 mg/L. The average background groundwater methane concentration in wells MD75-MW05, MD75-MW15, MD75-MW03, and monitoring point 75MP-8 is 0.04 mg/L. Samples collected from monitoring wells and monitoring points located near the areas with the highest BTEX concentrations contain the highest methane concentrations. At five shallow wells (MD75-MW04, 75MP-4S, MD75-MW08, MD75-MW12, and 75MP-2S) located within the 100-µg/L BTEX isopleth (Figure 4.3), methane concentrations range from 1.89 to 14.5 mg/L. The highest detected methane concentration of 15.4 mg/L occurred in the sample from deep well MW14. concentration in the paired shallow well (MW04) and monitoring point (MP-4S) were 1.89 and 14.5 mg/L, respectively. At the other well cluster (MP-2S/MW12/MW16), methane concentrations were very similar at all depth intervals. At the remaining monitoring well/point clusters for which methane data are available, the deep sample exhibited the highest methane concentration at clusters MW02/MP-6D and MW15/MP-3D, and the methane concentrations in the shallow and deep samples were similar at MP-9S/9D and MP-8S/8D. Therefore, analysis results for this parameter do not provide a consistent indication of the validity of the BTEX detections in the deeper portions of the shallow aquifer.

The stoichiometry of BTEX oxidation to carbon dioxide and methane by methanogenesis is presented in Table 4.5. On average, approximately 1 mg of total BTEX is degraded for every 0.78 mg of methane produced. Given a maximum detected shallow methane concentration of 14.5 mg/L and an assumed background concentration of 0.04 mg/L, the shallow groundwater has the capacity to assimilate approximately 18.5 mg/L (18,500 µg/L) of total BTEX through methanogenesis. This may be a conservative estimate of the assimilative capacity due to methanogenesis because these calculations are based on observed methane concentrations and not on the amount of carbon dioxide available in the aquifer, and microbial cell mass production was not taken into account by the stoichiometry shown in Table 4.5. Because methanogenesis produces more carbon dioxide than it consumes, an unlimited supply of carbon dioxide is theoretically available once the process of methanogenesis has been initiated. Therefore, methanogenic assimilative capacity could be much higher.







4.3.2.6 Reduction/Oxidation Potential

Redox potentials were measured at groundwater monitoring wells/points in March 1995 (Table 4.6). Redox potential is a measure of the relative tendency of a solution to accept or transfer electrons. The redox potential of a groundwater system depends on which electron acceptors are being reduced by microbes during BTEX oxidation. The redox potential at the site in March 1995 ranged from -169.4 millivolts (mV) at monitoring point 75MP-7S to 35 mV at well MD75-MW01. The preponderance of low measurements indicates that the groundwater in the shallow aquifer is generally reducing. This is consistent with the electron acceptor data, which indicate that the groundwater system beneath the study site has moved through the progression of redox reactions indicated on Table 4.5 and discussed in Section 4.3.2. As expected, there is a general tendency for the lowest redox potentials to occur within and along the flowpath of the BTEX plume (Figure 4.8).

At monitoring well/point cluster MP-4S/MW04/MW14, redox potentials are relatively similar at all of the sampled depth intervals, although the lowest redox potential was measured in the shallowest interval (75MP-4S). At well/point cluster MP-2S/MW12/MW16, redox potentials increase with depth, suggesting that dissolved BTEX contamination is more prevalent in the shallower intervals. Redox potentials were lowest in the shallow interval at three of the remaining seven well/point clusters (MW15/MP-3D, MP-9S/9D, and MP-7S/7D), while the reverse was true at the remaining four clusters (MW01/MP-5D, MW02/MP-6D, MP-8S/8D, and MP-1S/1D).

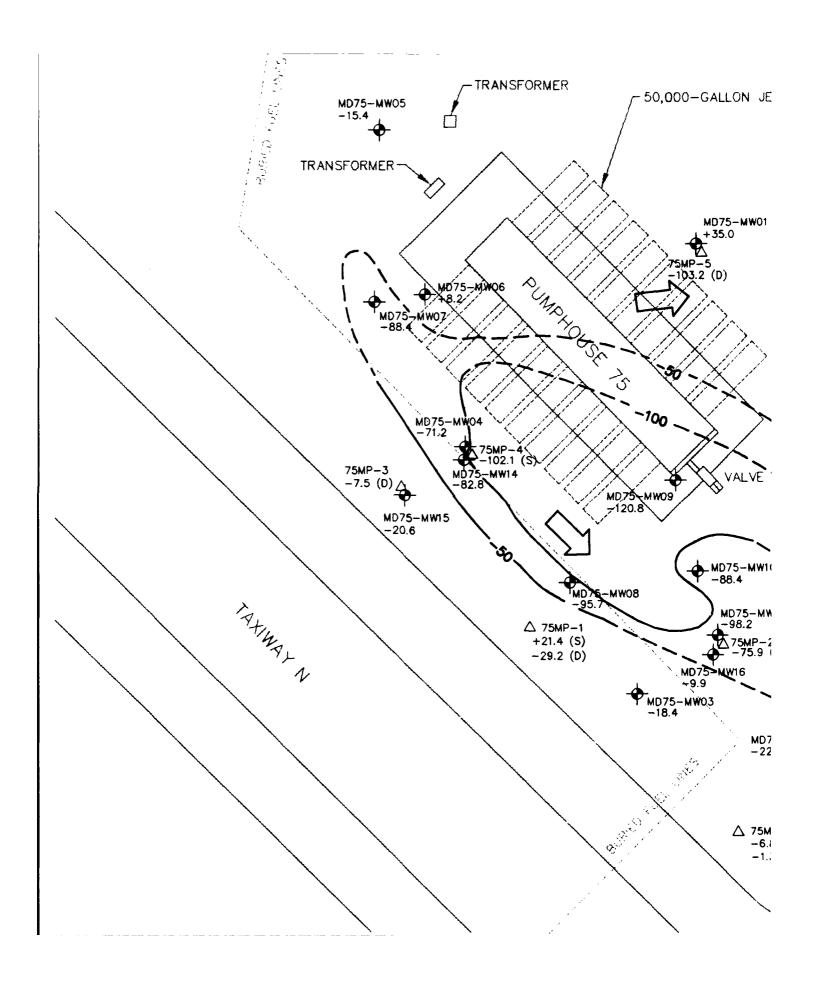
The redox potentials measured at the site are higher than the theoretical ranges of redox potentials that are favorable for sulfate reduction and methanogenesis. This discrepancy is a common problem associated with measuring oxidizing potential using field instruments. It is likely that the platinum electrode probes are not sensitive to some of the redox couples (e.g., sulfate/sulfide). Many authors have noted that field measured redox data alone cannot be used to reliably predict the electron acceptors that may be operating at a site (e.g., Stumm and Morgan, 1981; Godsey, 1994; Lovley et al., 1994).

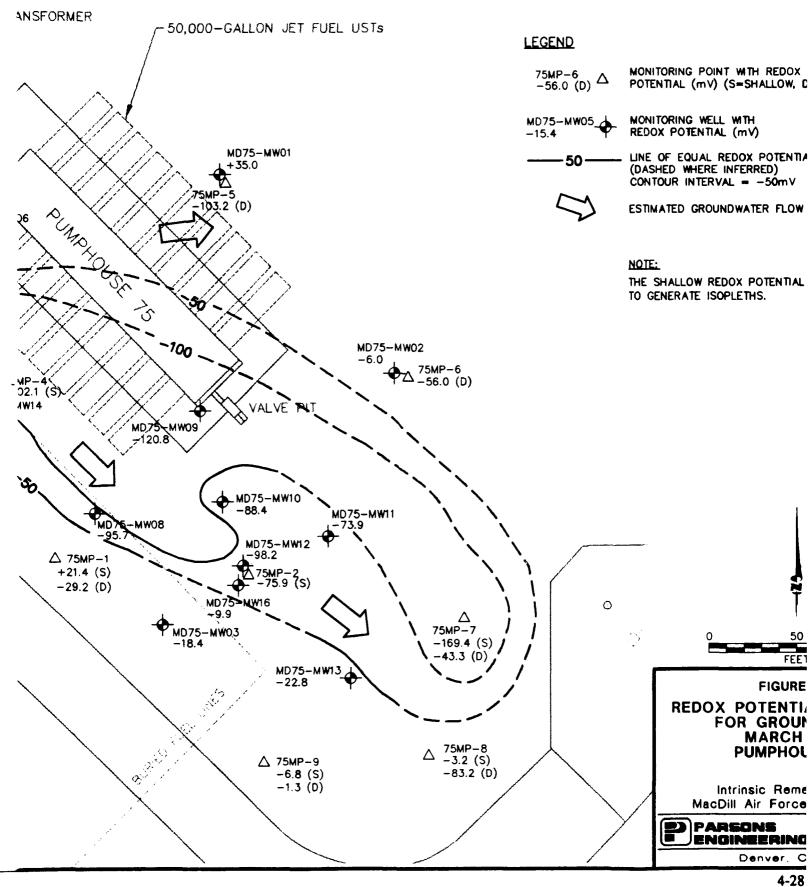
4.3.2.7 Alkalinity

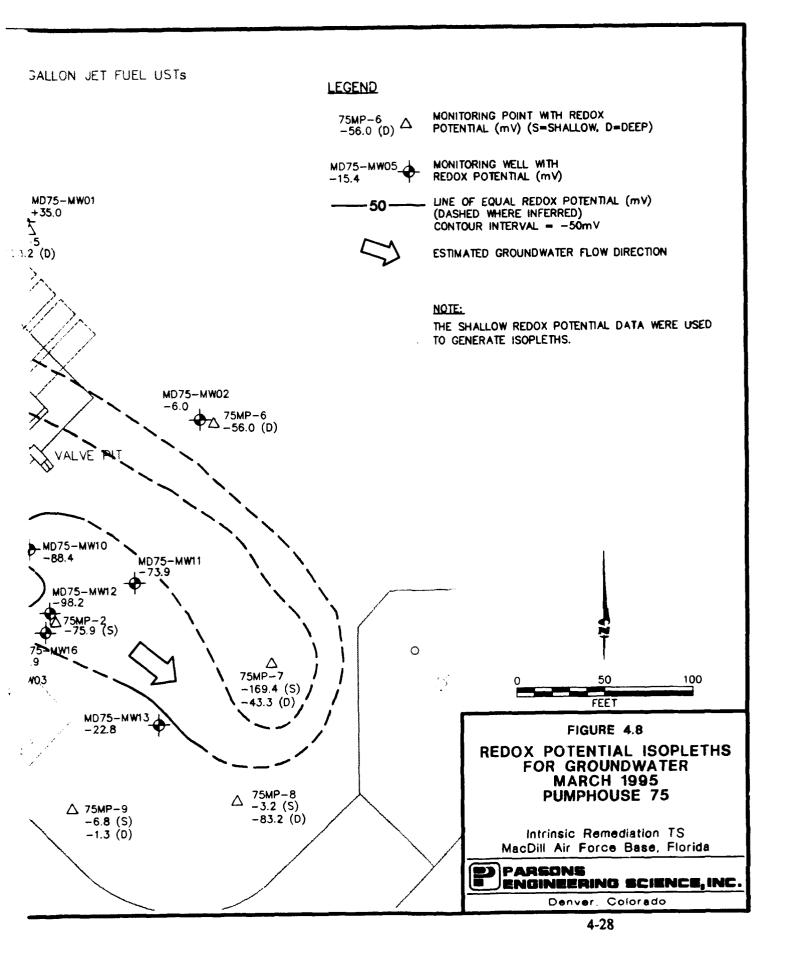
Total alkalinity (as calcium carbonate) was measured at groundwater monitoring wells/points in March 1995 (Table 4.6). Alkalinity is a measure of the ability of water to buffer changes in pH caused by the addition of biologically generated acids. In general, as the amount of total dissolved BTEX that is being oxidized increases, the total alkalinity increases. This is expected because the microbially mediated reactions causing biodegradation of fuel hydrocarbons produce carbon dioxide. Changes in alkalinity are most pronounced during aerobic respiration, denitrification, iron reduction, and sulfate reduction, and less pronounced during methanogenesis (Morel and Hering, 1993). In addition, Willey et al (1975) show that short-chain aliphatic acid ions, which can be produced during biodegradation of fuel hydrocarbons as intermediates, can contribute to alkalinity in groundwater.

Assuming complete mineralization, the alkalinity-enhancing reactions follow the generalized stoichiometry:

$$CH \rightarrow CO_2 + H_2O \rightarrow H_2CO_3 + CaCO_3 \rightarrow Ca^{2+} + 2HCO_3$$







*

The mass ratio of elkalinity produced during oxidation of BTEX can be calculated. The molar ratio of alkalinity (as CaCO₃) produced during benzene oxidation via aerobic respiration, denitrification, iron (III) reduction, and sulfate reduction is given by:

$$C_6H_6 \rightarrow 6CO_2 \rightarrow 6CaCO_3$$

Therefore, 6 moles of CaCO₃ are produced during the metabolism of 1 mole of benzene. On a mass basis, the ratio of alkalinity to benzene is given by:

Molecular weights:

Benzene

6(12)+6(1) = 78 gm

Alkalinity (as CaCO₃)

6(40)+6(12)+18(16)=600 gm

Mass ratio of alkalinity to benzene = 600:78 = 7.69:1

Therefore, 7.69 mg of alkalinity (as CaCO₃) are produced during the metabolism of 1 mg of benzene. This means that for every 1 mg of alkalinity produced, 0.13 mg of BTEX is destroyed. Similar calculations can be made for toluene, ethylbenzene, and xylene. Table 4.7 summarizes the results of these calculations for all of the BTEX compounds during aerobic respiration, denitrification, iron (III) reduction, and sulfate reduction. Methanogenesis does not cause significant changes in alkalinity.

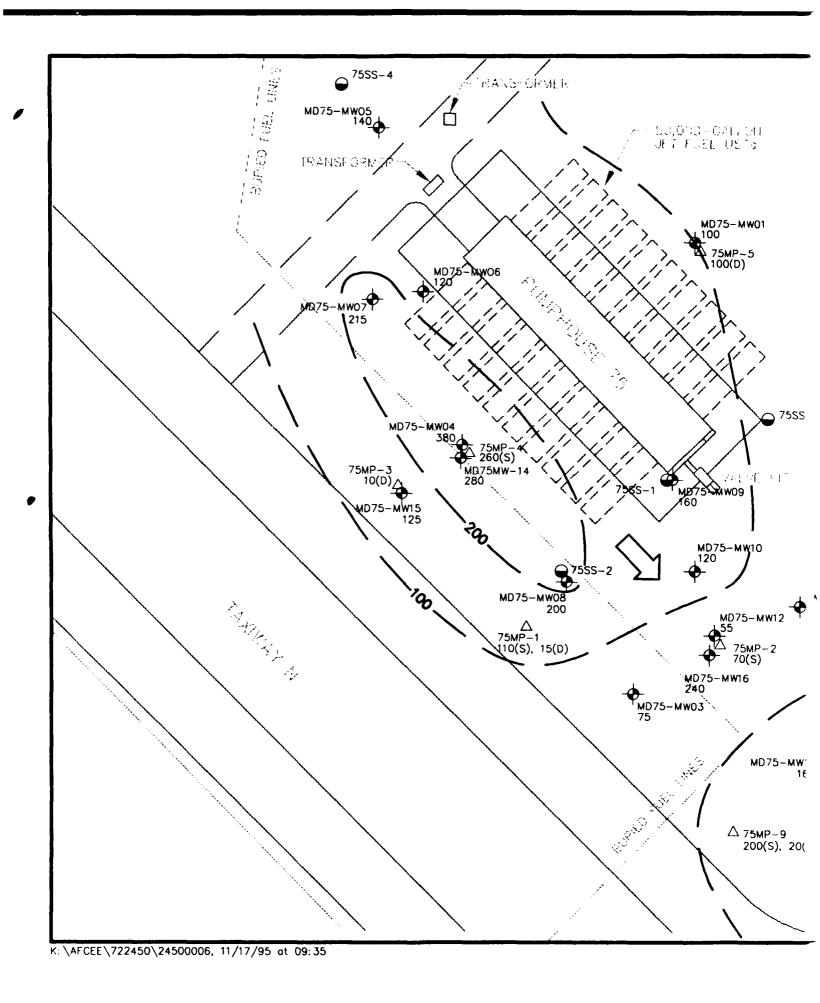
As shown in Figure 4.9, total alkalinity at Pumphouse 75 is in the low to moderate range for groundwater, varying from 10 mg/L at monitoring point 75MP-3D to 380 mg/L at MD75-MW04. This level of alkalinity might not be sufficient to buffer potential changes in pH caused by biologically mediated BTEX oxidation reactions; therefore, it might not be possible to utilize some electron receptors to their full availability. At monitoring well/point cluster MP-4S/MW04/MW14, alkalinity values are similar at all of the sampled depth intervals. Conversely, alkalinity values are lowest in the shallower intervals at cluster MP-2S/MW12/MW16, suggesting that microbial biodegradation of hydrocarbons is most prevalent in the deepest interval at this location. At the remaining well/point clusters, alkalinity values in the shallow and deep intervals tend to be either similar or higher in the shallower interval.

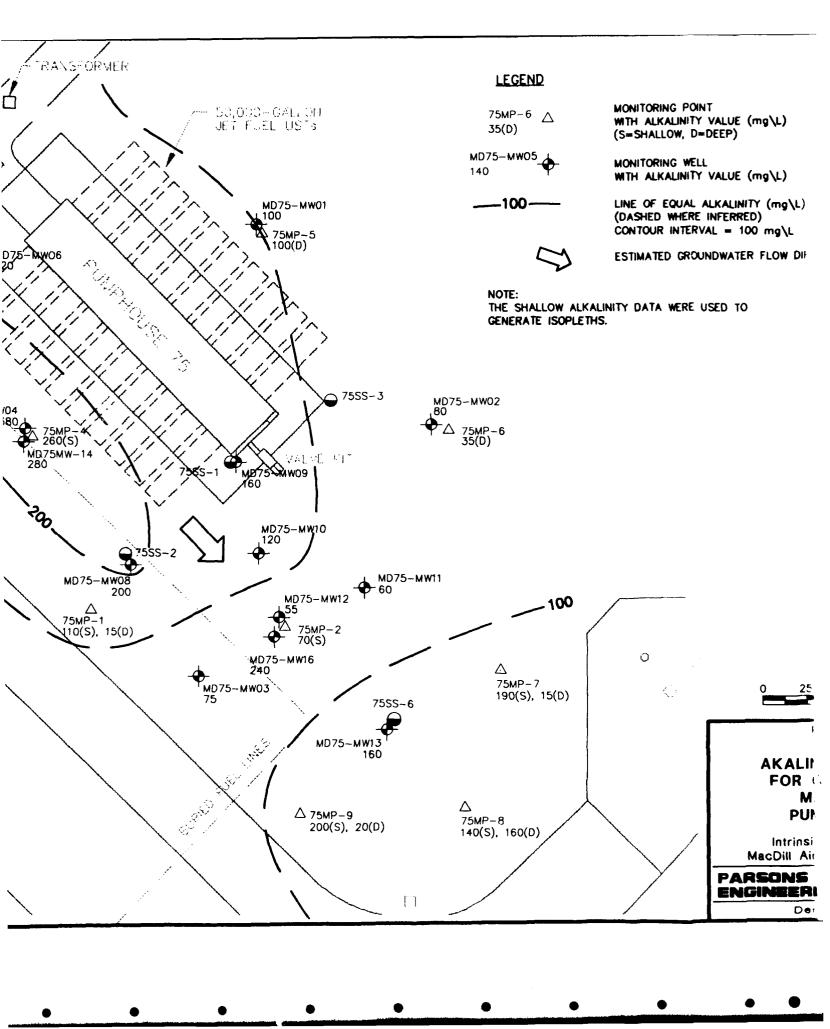
The mass ratio of alkalinity (as $CaCO_3$) produced to BTEX degraded during aerobic respiration, denitrification, ferric iron reduction, and sulfate reduction is shown in Table 4.7. On average, approximately 7.69 mg of alkalinity (as $CaCO_3$) is produced for every 0.13 mg of BTEX destroyed. Given a maximum detected alkalinity of 380 mg/L and an assumed background concentration of 100 mg/L, the shallow groundwater has the capacity to assimilate approximately 4.7 mg/L (4,700 μ g/L) of total BTEX. This calculation is speculative due to the uncertainty associated with background alkalinity values.

TABLE 4.7 MASS RATIO OF ALKALINITY (AS CACO₃) PRODUCED TO BTEX DEGRADED DURING AEROBIC RESPIRATION, DENITRIFICATION, IRON (III) REDUCTION, AND SULFATE REDUCTION PUMPHOUSE 75

INTRINSIC REMEDIATION TS MACDILL AIR FORCE BASE, FLORIDA

Alkalinity Production Reaction	Stoichiometric Mass Ratio of Alkalinity Produced to BTEX Degraded	Mass of Compound Degraded (mg) per unit mass of Alkalinity Produced (mg)
$C_6H_6 \rightarrow 6CO_2 \rightarrow 6CaCO_3$ Benzene Oxidation	600:78	0.13
$C_7H_8 \rightarrow 7CO_2 \rightarrow 7CaCO_3$ Toluene Oxidation	700:92	0.13
$C_1H_{10} \rightarrow 8CO_2 \rightarrow 8CaCO_3$ Ethylbenzene Oxidation	800:104	0.13
$C_8H_{10} \rightarrow 8CO_2 \rightarrow 8CaCO_3$ Xylene Oxidarion	800:104	0.13





LEGEND MONITORING POINT -GALLON EL USTS 75MP~6 △ WITH ALKALINITY VALUE (mg/L) 35(D) (S=SHALLOW, D=DEEP) MD75-MW05_ MONITORING WELL 140 WITH ALKALINITY VALUE (mg/L) -100-LINE OF EQUAL ALKALINITY (mg/L) MD75-MW01 100 (DASHED WHERE INFERRED) CONTOUR INTERVAL = 100 mg/L 75MP-5 100(D) ESTIMATED GROUNDWATER FLOW DIRECTION THE SHALLOW ALKALINITY DATA WERE USED TO GENERATE ISOPLETHS. 75SS-3 MD75-MW02 80 75MP-6 35(D) 75 Awo9 MD75-MW11 MD75-MW12 100 75MP-2 70(S) 0 D75-MW16 40 75MP-7 03 100 50 190(S), 15(D) FEET FIGURE 4.9 MD75-MW13 **AKALINITY ISOPLETHS** FOR GROUNDWATER **MARCH 1995** Δ △ 75MP-9 **PUMPHOUSE 75** 75MP-8 200(S), 20(D) 140(S), 160(D) Intrinsic Remediation TS MacDill Air Force Base, Florida PARSONS ENGINEERING SCIENCE, INC. [] Denver, Colorado

4.3.2.8 pH

Measurements of groundwater pH made in March 1995 are summarized in Table 4.6 and illustrated on Figure 4.10. Measured pH values ranged from 4.61 to 7.69 standard units; the majority of the values are within the optimal pH range of 5 to 9 standard units for BTEX-degrading microbes in groundwater Denitrification and methanogenic biodegradation rates are usually optimum between pH 7 and 8, and may drop off rapidly (but not cease altogether) below pH 6. As shown on Figure 4.10, all of the pH values measured within the 100-μg/L BTEX isopleth (Figure 4.3) are relatively low (below 6.0), possibly because of the acids produced during the biodegradation of petroleum hydrocarbons. pH values measured upgradient, crossgradient, and downgradient from the BTEX plume are mostly greater than 6.0.

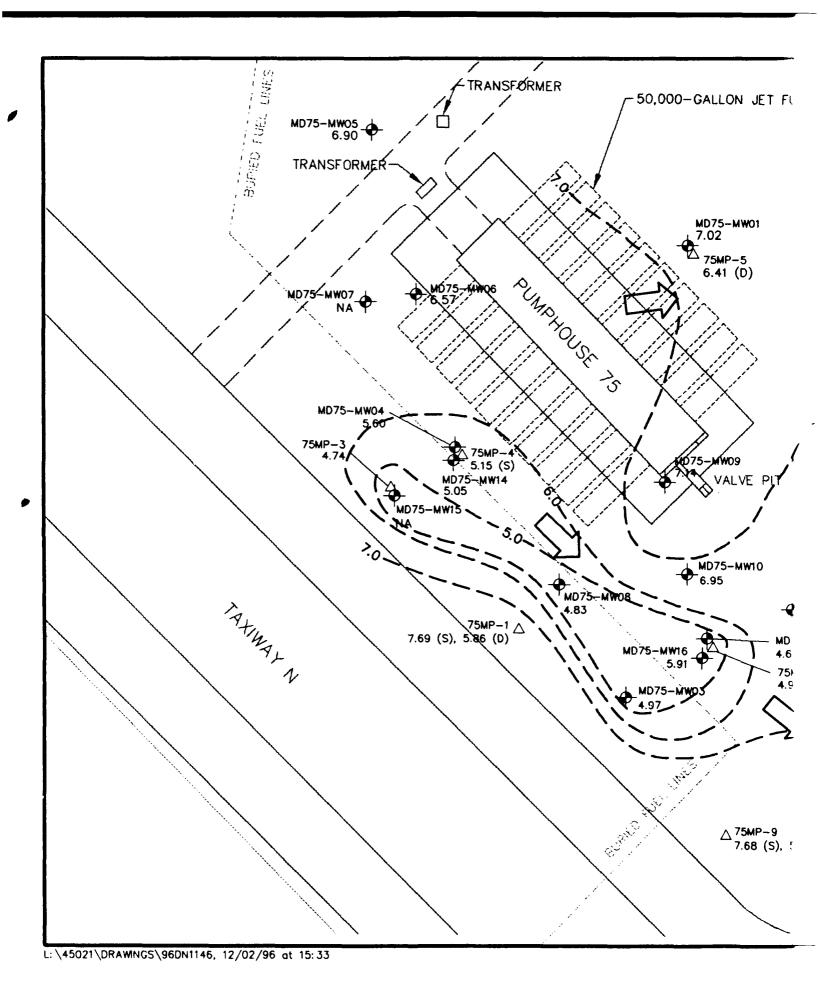
4.3.2.9 Temperature

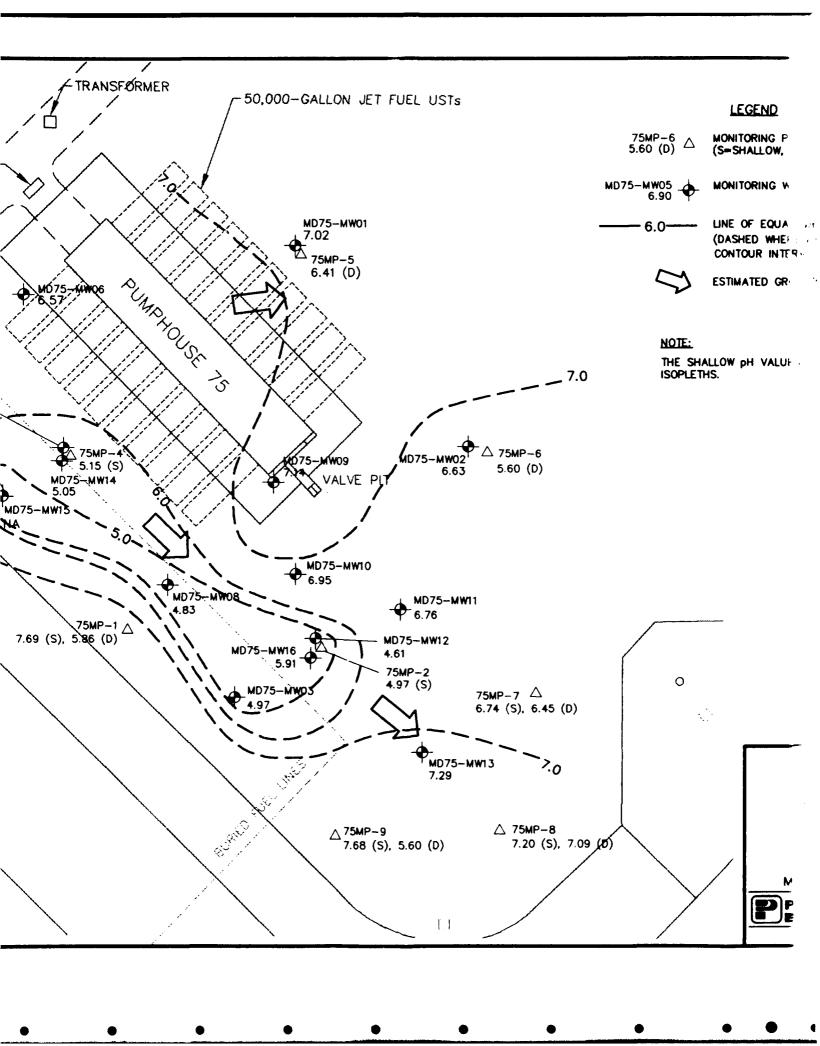
Groundwater temperature measurements made in March 1995 are summarized in Table 4.6. Temperature affects the types and growth rates of bacteria that can be supported in the groundwater environment, with high temperatures generally resulting in higher growth rates. For every 10-degree-Celsius (°C) increase in groundwater temperature, the biodegradation rate should approximately double. Temperatures in the shallow aquifer varied from 22.5°C to 30.5°C. These are relatively warm temperatures for shallow groundwater, suggesting that bacterial growth rates should be enhanced.

4.3.2.10 Expressed Assimilative Capacity

The data presented in the preceding sections suggest that degradation of BTEX compounds is occurring primarily through the microbially mediated anaerobic processes of sulfate reduction and methanogenesis. Based on the stoichiometry presented in Table 4.5, the expressed BTEX assimilative capacity of groundwater at Pumphouse 75 is at least 23,900 μ g/L (Table 4.8). This value does not include the computed assimilative capacities associated with DO (aerobic biodegradation) and nitrate (denitrification) due to the speculative nature of those calculations and the apparent relative insignificance of these processes. An expressed assimilative capacity of 4,700 μ g/L was calculated using alkalinity data. This value may be low due to the predominance of methanogenesis as a biodegradation mechanism, which does not enhance the alkalinity of the groundwater.

A closed system with 2 liters of water can be used to help visualize the physical meaning of assimilative capacity. Assume that the first liter contains no fuel hydrocarbons, but it contains fuel-degrading microorganisms and has an assimilative capacity of exactly "x" µg of fuel hydrocarbons. The second liter has no assimilative capacity; however, it contains fuel hydrocarbons. As long as these 2 liters of water are kept separate, biodegradation of the fuel hydrocarbons will not occur. If these 2 liters are combined in a closed system, biodegradation will commence and continue until the fuel hydrocarbons are depleted, the electron acceptors are depleted, or the environment becomes acutely toxic to the fuel-degrading microorganisms. Assuming a nonlethal environment, if fewer than "x" µg of fuel hydrocarbons were in the second liter, all of the fuel hydrocarbons will eventually degrade given a sufficient time; likewise, if





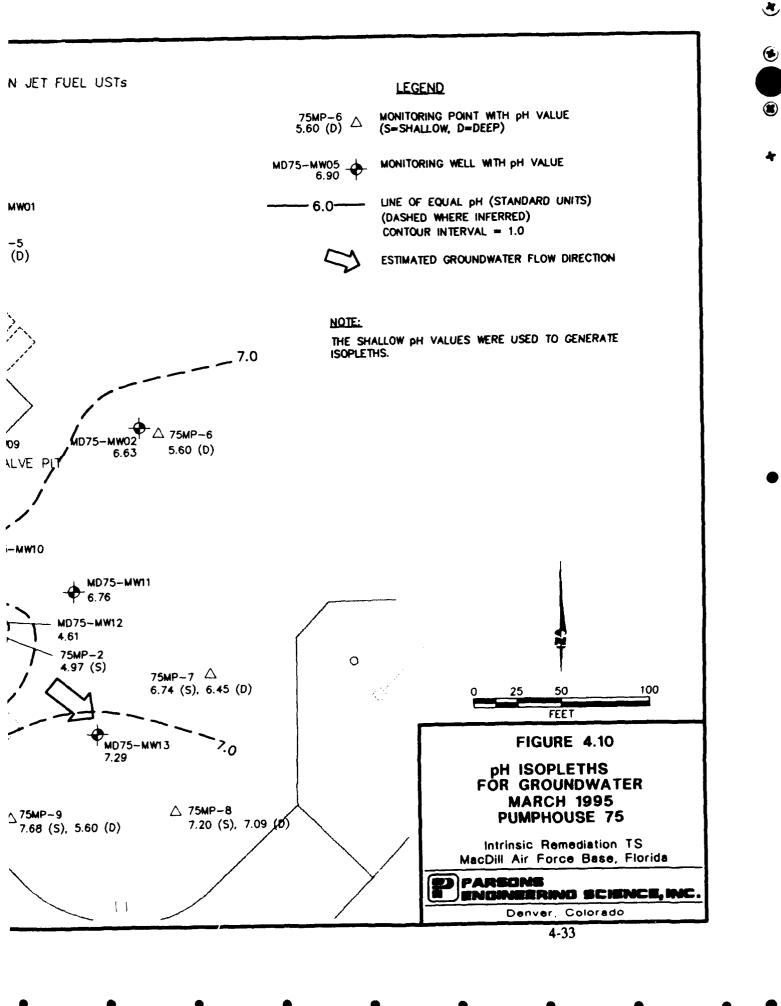


TABLE 4.8 EXPRESSED ASSIMILATIVE CAPACITY OF SITE GROUNDWATER PUMPHOUSE 75 INTRINSIC REMEDIATION TS MACDILL AIR FORCE BASE, FLORIDA

Biodegradation Process	Expressed BTEX Assimilative Capacity (µg/L)
Iron Reduction	950
Sulfate Reduction	5,250
Methanogenesis	18,500
Expressed Assimilative Capacity	24,700
Expressed Assimilative Capacity using Alkalinity Data	4,700

greater than "x" µg of fuel hydrocarbons were in the second liter of water, only "x" µg of fuel hydrocarbons would ultimately degrade. The groundwater beneath Pumphouse 75 is an open system that continually receives additional electron receptors from flow through the aquifer and infiltration of precipitation. This means that the assimilative capacity is not fixed as it is in a closed system, and therefore cannot be compared directly to contaminant concentration in the groundwater. Rather, the expressed assimilative capacity of groundwater is intended to serve as a qualitative tool. Although the expressed assimilative capacity at this site is greater than the highest measured total BTEX concentration, the fate of BTEX in groundwater and the potential impact on receptors are dependent on the relationship between the kinetics of biodegradation and the solute transport velocity (Chapelle, 1994). This significant expressed assimilative capacity is a strong indicator that biodegradation is occurring; however, it is not confirmation that biodegradation will proceed to completion before potential downgradient receptors are impacted.

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SECTION 5

GROUNDWATER MODEL

5.1 GENERAL OVERVIEW AND MODEL DESCRIPTION

In order to help estimate degradation rates for dissolved BTEX compounds at Pumphouse 75 and to help predict the future migration of these compounds, Parsons ES modeled the fate and transport of the dissolved BTEX plume. The modeling effort had three primary objectives: 1) to predict the future extent and concentration of the dissolved contaminant plume by modeling the combined effects of advection, dispersion, sorption, and biodegradation; 2) to assess the potential for downgradient receptors to be exposed to contaminants at concentrations above regulatory levels of concern; and 3) to provide technical support for the natural attenuation remedial option at post-modeling regulatory negotiations. The model was developed using site-specific data and conservative assumptions about governing physical and chemical processes. Because of the conservative nature of model input, the reduction in contaminant mass caused by natural attenuation is expected to exceed model predictions. This analysis is not intended to represent a baseline assessment of potential risks posed by site contamination.

The Bioplume II code was used to estimate the potential for dissolved BTEX migration and degradation by naturally occurring mechanisms operating at Pumphouse 75. The Bioplume II model incorporates advection, dispersion, sorption, and biodegradation to simulate contaminant plume migration and degradation. The model is based upon the US Geological Survey (USGS) Method of Characteristics (MOC) two-dimensional (2-D) solute transport model of Konikow and Bredehoeft (1978). The model was modified by researchers at Rice University to include a biodegradation component that is activated by a superimposed PO plume. Incorporating the work of Borden and Bedient (1986), the model assumes a reaction between DO and BTEX that is instantaneous relative to the advective groundwater velocity. Bioplume II solves the USGS 2-D solute transport equation twice, once for hydrocarbon concentrations in the aquifer and once for a DO plume. The two plumes are combined using superposition at every particle move to simulate the instantaneous, biologically-mediated, reaction between hydrocarbons and oxygen.

In recent years it has become apparent that anaerobic processes such as denitrification, iron reduction, sulfate reduction, and methanogenesis can be important BTEX degradation mechanisms (Grbic'-Galic', 1990; Beller et al., 1992; Edwards et al., 1992; Edwards and Grbic'-Galic', 1992, Grbic'-Galic' and Vogel, 1987; Lovely et al., 1989; Hutchins, 1991). Because there is evidence that anaerobic biodegradation processes are occurring at the Pumphouse 75 site, these processes were accounted for during Bioplume II modeling using a first-order anaerobic decay coefficient. The following subsections discuss in more detail the model setup, input parameters and assumptions, model calibration, and simulation results.

5.2 CONCEPTUAL MODEL DESIGN AND ASSUMPTIONS

Prior to developing a groundwater model, it is important to determine if sufficient data are available to provide a reasonable estimate of aquifer conditions. In addition, it is important to ensure that any limiting assumptions can be justified. The most important assumption made when using the Bioplume II model is that electron-acceptor-limited biodegradation is occurring at the site. The Bioplume II model assumes that the limiting factors for biodegradation are: 1) the presence of an indigenous hydrocarbon degrading microbial population, and 2) sufficient background electron acceptor concentrations. Data and information presented in Sections 3 and 4 suggest that sulfate and carbon dioxide (methanogenesis) are being used as the primary electron acceptors for anaerobic biodegradation. The model assumes that DO is the only electron acceptor that reacts instantaneously with the BTEX plume. Anaerobic biodegradation of petroleum hydrocarbons was simulated using a first-order decay constant. Selection of this constant is discussed in Section 5.3.5.

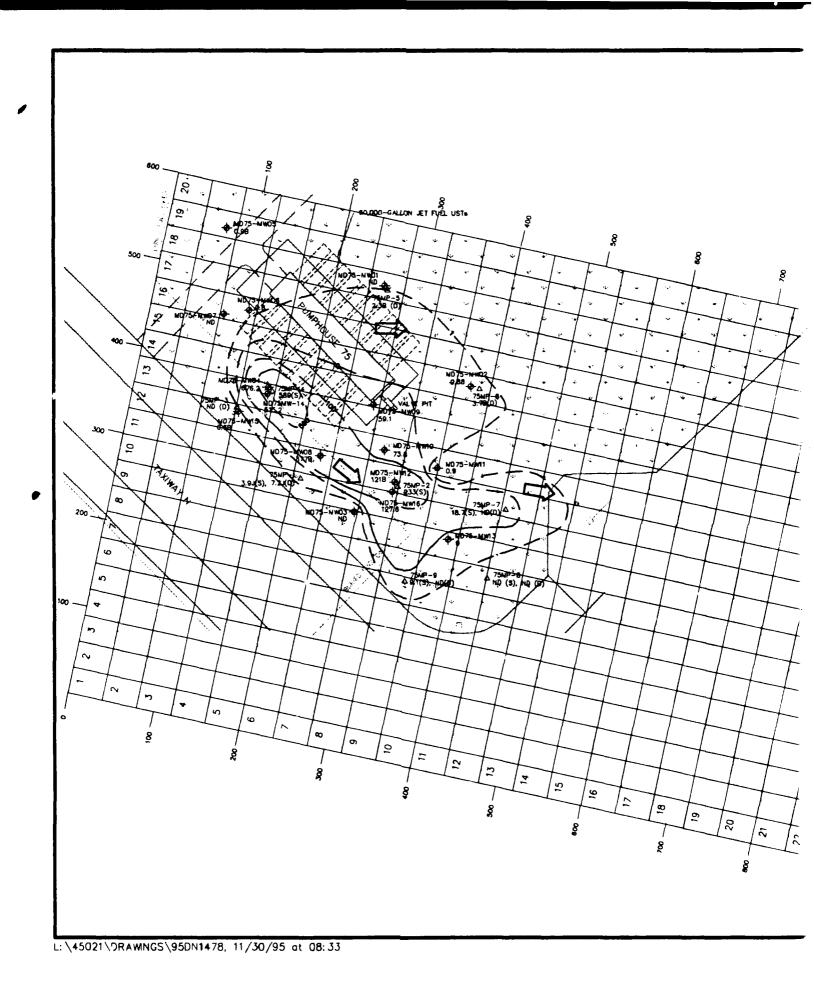
On the basis of the data presented in Section 3, the shallow saturated zone was conceptualized and modeled as a shallow unconfined aquifer comprised primarily of sand (Figures 3.2 and 3.3). As discussed in Section 4.3.1.1, detections of BTEX in two monitoring wells screened in sand and clayey limestone layers below the shallow sand zone suggest that vertical migration of dissolved BTEX may be occurring. In some cases (e.g., ferrous iron and alkalinity levels in well cluster MP-2S/MW12/MW16), the geochemical data support the detections of significant BTEX concentrations at depth in the shallow aquifer (Table 4.3). Overall however, the geochemical data are inconclusive, and the validity of the contaminant detections in the two deep wells could not be confirmed. In general, there are insufficient hydrogeologic and contaminant data for this deeper interval to justify the use of a threedimensional numerical model. Therefore, a 2-D model was considered to be appropriate for modeling the horizontal migration of the identified BTEX plume at the Pumphouse 75 site. Recommendations for additional investigation of deeper intervals to better characterize any vertical migration of fuel hydrocarbons are contained in Section 8. Available evidence suggests that mobile LNAPL is not present at the site. However, continuing sources of dissolved BTEX contamination remain as residual LNAPL in the soil.

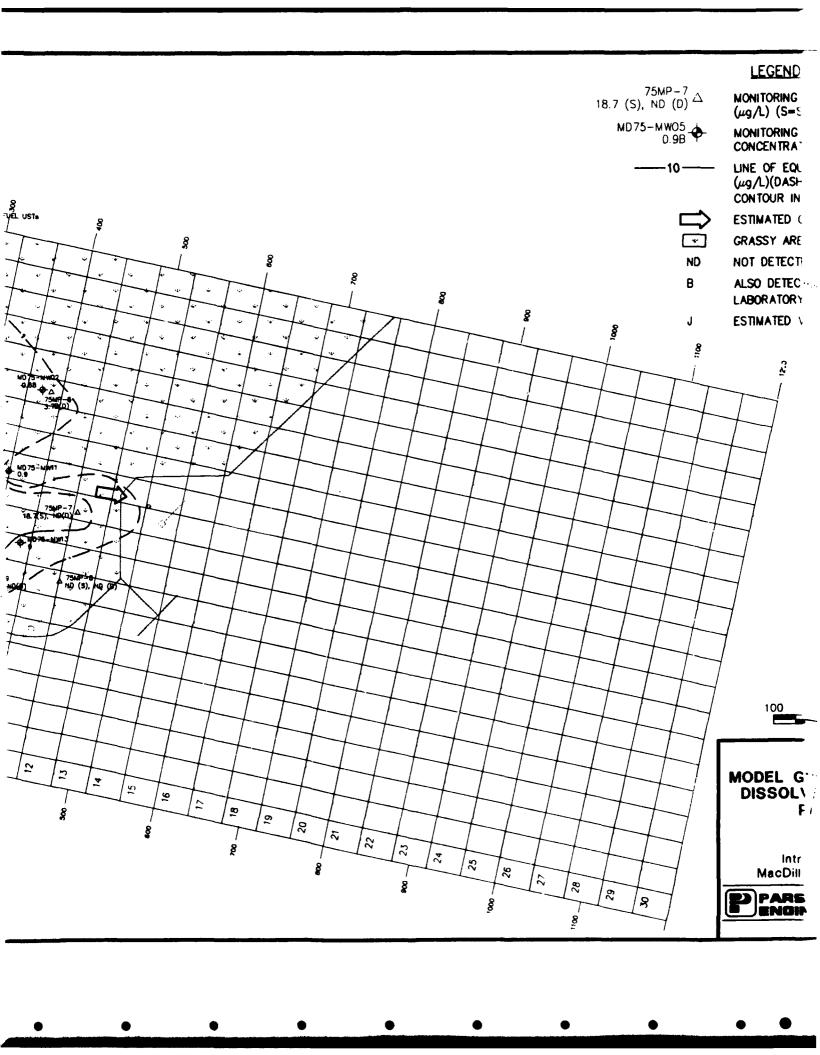
5.3 INITIAL MODEL SETUP

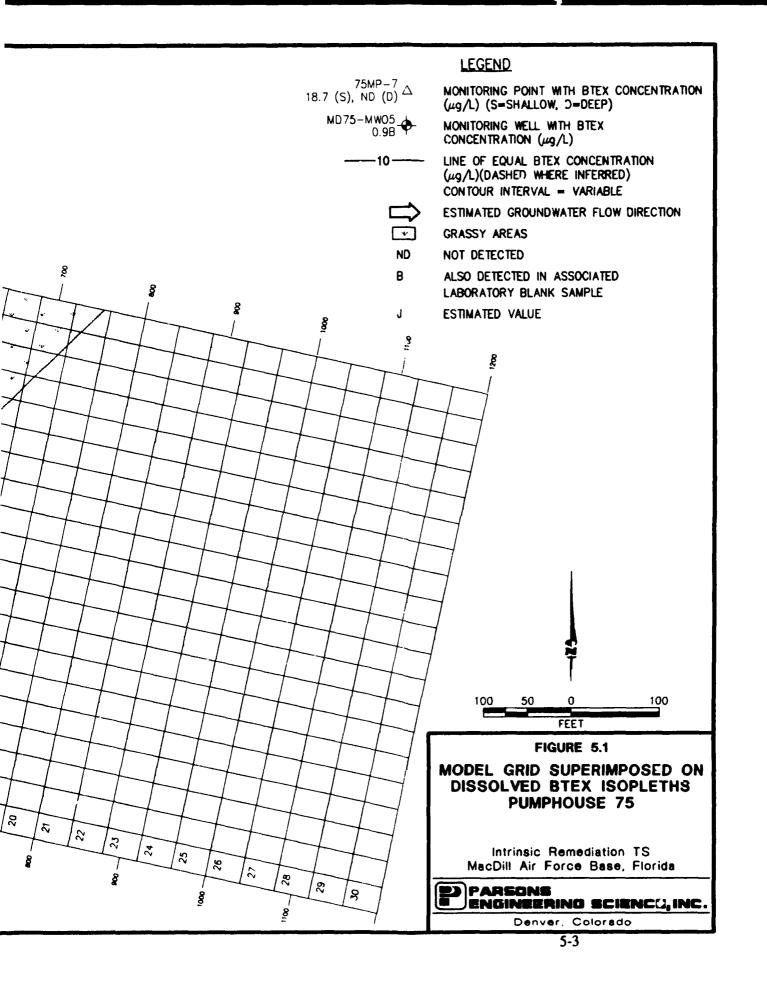
Where possible, the initial setup for this model was based on site-specific data. Where site-specific data were not available (e.g., effective porosity), reasonable assumptions were made on the basis of widely accepted literature values for materials similar to those found in the shallow aquifer. The following sections describe the basic model setup. Those Bioplume II model parameters that were varied during model calibration are discussed in Section 5.4.

5.3.1 Grid Design and Boundary Conditions

The maximum grid size for the Bioplume II model is limited to 20 columns by 30 rows. The dimension of each column and row can range from 0.1 to 999.9 feet. A 20- by 30-cell grid was used to model the Pumphouse 75 site. Each grid cell was 40 feet long by 30 feet wide. The grid was oriented with the longest dimension parallel to the overall direction of groundwater flow. The model grid covers an area of 720,000 square feet, or approximately 16.5 acres. The full extent of the model grid is indicated on Figure 5.1.







Model boundaries are mathematical statements that represent hydrogeologic boundaries, such as areas of specified head (e.g., surface water bodies or contour lines of constant hydraulic head) or specified flux. Hydrogeologic boundaries are represented by three mathematical statements that describe the hydraulic head at the model boundaries. These include:

• Specified-head boundaries (Dirichlet condition) for which the head is determined as a function of location and time only. Surface water bodies exhibit constant head conditions. Specified-head boundaries are expressed mathematically as:

$$Head = f(x, y, z, t)$$

• Specified-flow boundaries (Neumann conditions) for which the mathematical description of the flux across the boundary is given. The flux is defined as a volumetric flow rate per unit area (e.g., ft³/ft²/day). No-flow boundaries are a special type of specified flow boundary and are set by specifying the flux to be zero. Examples of no-flow boundaries include groundwater divides and impermeable hydrostratigraphic units. Specified-flux boundaries are expressed mathematically as:

$$Flux = f(x, y, z, t)$$

• Head-dependent flow boundaries (Cauchy or mixed-boundary conditions) where the flux across the boundary is calculated from a given boundary head value. This type of flow boundary is sometimes referred to as a mixed-boundary condition because it is a combination of a specified-head boundary and a specified-flow boundary. Head-dependent flow boundaries are used to model leakage across semipermeable boundaries. Head-dependent flow boundaries are expressed mathematically as (Bear, 1979):

$$Flux = \frac{(H_0 - H)K'}{R'}$$

where:

H = Head in the zone being modeled (generally the zone containing the contaminant plume),

 H_0 = Head in external zone (separated from plume by semipermeable layer),

K' = Hydraulic conductivity of semipermeable laver, and

B' = Thickness of semipermeable layer.

Natural hydraulic boundaries are modeled using a combination of the three types of model boundary conditions listed above. When possible, hydrologic boundaries such as surface water bodies, groundwater divides, contour lines, or hydrologic barriers should coincide with the perimeter of the model. In areas lacking obvious hydrologic boundaries, specified-head or specified-flux boundaries can be specified at the model perimeter if the boundaries are far enough removed from the contaminant plume that transport calculations are not affected. Bioplume II requires the entire model domain to be bounded by zero-flux cells (also known as

no-flow cells), with other boundary conditions established within the subdomain specified by the no-flow cells.

Specified-head boundaries for the model were set on the western and eastern perimeter of the model grid to simulate the west to east groundwater flow observed at the site. The hydraulic heads along the western boundary were estimated to range from 5.27 to 5.39 feet msl. The heads along the eastern model boundary ranged from 4.24 to 4.26 feet msl. These constant-head cells were placed far enough away from the BTEX plume to avoid potential boundary interferences.

The northern and southern model boundaries were configured as no-flow (specified flux) boundaries. In this case, the flux through these boundaries is assumed to be zero because flow is generally parallel to these boundaries. A few selected cells adjacent to the northern and southern boundaries were designated as constant-head cells to assist in the calibration of the groundwater flow model. The base or lower boundary of the model is also assumed to be no-flow, and is defined by the upper surface of the confining clay layer (Figure 3.2). An aquifer thickness of 20 feet was assumed based on the stratigraphic information presented in Section 3. The upper model boundary is defined by the simulated water table surface.

5.3.2 Groundwater Elevation and Gradient

The March 1995 water table elevation map presented in Figure 3.5 was used to define the starting heads input into the Bioplume II model. Groundwater flow in the vicinity of the Pumphouse 75 site is to the east and southeast with an average gradient of approximately 0.0009 ft/ft. Additional groundwater flow direction and gradient data are presented by BVWS (1995). These data suggest that there are temporal variations in groundwater flow direction, but the overall trend at the site is toward the east and southeast. Historic hydraulic gradients are consistent with those calculated by Parsons ES using the March 1995 groundwater elevation data. Therefore, it was assumed that the observed water levels were representative of steady-state conditions. As described in Section 5.4.1, the model was calibrated to the observed March 1995 water table.

5.3.3 BTEX Concentrations

The total dissolved BTEX concentrations obtained from laboratory analytical results for each well location were used for model development. At well nests, the highest BTEX concentration observed at that location was used. Table 4.3 presents dissolved BTEX concentration data for March 1995, and Figure 4.3 shows the spatial distribution of dissolved BTEX compounds.

A comparison between the November 1994 and March 1995 BTEX plumes (see Appendix A for the 1994 plume) indicates that the areal extents of the two plumes are similar. The most significant difference between the plumes is the apparent reduction in contaminant concentrations at monitoring wells MD75-MW04 and MD75-MW08 from November 1994 to March 1995. In addition, as described in Section 4.3.1.1, the BTEX concentrations detected in the deeper wells MD75-MW14 and MD75-MW16 were observed to increase during that time period. The shape and distribution of the total BTEX plume is the result of advective-dispersive transport and biodegradation of dissolved BTEX contamination. As described in Section 5.4.2, the simulated BTEX plume was calibrated to match the observed BTEX plume in March 1995, starting from the BTEX plume that was observed in November 1994.

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5.3.4 Dissolved Oxygen

As discussed previously, the Bioplume II model assumes an instantaneous reaction between the BTEX plume and the DO plume. The discussion presented in Section 4 suggests that sulfate and carbon dioxide (methanogenesis) are being used as primary electron acceptors for biodegradation of BTEX compounds at the Pumphouse 75 site. The total BTEX plume at the site was modeled assuming that DO was the only electron acceptor being utilized at a rate that is instantaneous relative to the advective ground water flow velocity for the biodegradation of the BTEX compounds. As described in Section 5.3.5, anaerobic biodegradation was accounted for through the use of a first-order decay rate constant.

The measured DO concentrations in monitoring wells/points MD75-MW05, MD75-MW06, MD75-MW07, 75MP-3, MD75-MW15, 75MP-1, 75MP-9, 75MP-8, and MD75-MW01 (which were all either on the edge or outside of the March 1995 dissolved BTEX plume) ranged from 0.08 mg/L to 0.48 mg/L and averaged 0.19 mg/L. Within and directly downgradient from the BTEX plume, DO concentrations in shallow groundwater ranged from 0.08 to 0.14 mg/L, and averaged 0.10 mg/L. The highest (shallow) DO concentration of 0.48 mg/L was measured in monitoring point 75MP-9S, adjacent to the buried fuel lines southeast of the pumphouse (Figure 4.4). For model development, initial DO concentrations directly upgradient and crossgradient from the plume were assumed to equal 0.15 mg/L, and areas within and downgradient from the plume were assigned an initial DO concentration of 0.10 mg/L. In addition, it was assumed that background DO concentrations further upgradient of the site were at least 0.2 mg/L. Therefore, the water input into the model via the upgradient constant-head cells was assigned a DO concentration of 0.2 mg/L. This is a reasonable assumption considering the perimeter DO concentrations presented above and the measured background DO concentrations in very similar hydrogeologic conditions at Site 56, the Army Air Force Exchange Service (AAFES) service station at MacDill AFB, of 0.8 mg/L.

Due to the shallow water table and the presence of sandy soils with a relatively low natural organic carbon content, it is reasonable to assume that the precipitation that percolates through the vadose zone contains some DO when it reaches the water table. Assuming that the average temperature of precipitation falling on the site is 21°C (70 °F), the precipitation would have a DO concentration of approximately 8.7 mg/L. Some percentage of this DO is most likely consumed as the water percolates through the vadose zone as a result of microbial processes which utilize naturally occurring organic carbon in the soil. Therefore, the recharge was assigned a DO concentration of 3 mg/L. DO was not added to the recharge water in grid cells where the soils were believed to be contaminated with petroleum, as it possible that the DO would be largely consumed prior to reaching the water table. Oxygen input data are included in Appendix C.

5.3.5 A macrobic Degradation Rates

Available data strongly suggest that anaerobic degradation is occurring at the Pumphouse 75 site, and that aerobic degradation processes are relatively insignificant (Table 4.7). Anaerobic degradation must therefore be simulated with Bioplume II to make solute transport predictions that are meaningful. The Bioplume II model simulates anaerobic biodegradation by assuming that such degradation follows first-order kinetics. As with a large number of biological processes, anaerobic biodegradation can generally be described using a first-order rate constant and the equation:

$$\frac{C}{C_0} = e^{-kt}$$

where:

C = Contaminant Concentration at Time t,

 C_0 = Initial Contaminant Concentration,

k = Coefficient of Anaerobic Decay (anaerobic rate constant), and

t = time.

A convenient way of estimating biodegradation rate constants is to use compounds present in the dissolved contaminant plume that that are biologically recalcitrant. One such compound that is useful in some, but not all, groundwater environments is trimethylbenzene (TMB). The three isomers of this compound (1,2,3-TMB, 1,2,4-TMB, and 1,3,5-TMB) are generally present in sufficient quantities in fuel mixtures to be readily detectable when dissolved in groundwater. In addition, the TMB isomers are fairly recalcitrant to biodegradation under anaerobic conditions; however, the TMB isomers do not make good tracers under aerobic conditions (because they are readily biodegraded in aerobic environments). The degree of recalcitrance of TMB is site-specific, and the use of this compound as a tracer must be evaluated on a case-by-case basis. Another compound of potential use as a conservative tracer is tetramethylbenzene (tetraMB); however, detectable dissolved tetraMB concentrations are generally less common than detectable dissolved TMB concentrations.

An ideal tracer would have Henry's Law and soil sorption coefficients identical to the contaminant of interest; however, TMB and tetraMB are more hydrophobic than BTEX, chlorinated ethenes, and chlorinated ethanes, resulting in higher soil sorption coefficients. This causes preferential sorption of TMB and tetraMB, and an increase in the coefficients of retardation for these compounds in the aquifer. Therefore, for these compounds it is advisable to account for the difference in contaminant and tracer velocity resulting from the higher soil sorption and consequent retardation of TMB and tetraMB. Otherwise, using TMB and tetraMB as tracers can be so conservative that estimated biodegradation rates can be negative.

The corrected concentration at point i can be represented by the following equation:

$$C_{i,corr} = C_{i-1,corr} \left(\frac{C_i}{C_{i-1}} \right) \left(\frac{1}{\left(1 - \frac{R_c}{R_i} \left(1 - \frac{T_i}{T_{i-1}}\right)\right)} \right)$$

where:

 $C_{i,corr}$ = corrected contaminant concentration at point i

 $C_{i-1,corr}$ = corrected contaminant concentration at point i-1. (If point i-1 is the first or most upgradient point, $C_{i-1,corr}$ is equivalent to the observed contaminant concentration.)

 C_i =observed contaminant concentration at point i

 C_{i-1} = observed contaminant concentration at point i-1

 T_i =observed tracer concentration at point i

 T_{i-1} = observed tracer concentration at point i-1

 R_c , R_t = the coefficient of retardation for the contaminant and tracer, respectively

Note: This assumes that $R_i/R_c + T_i/T_{i-1} > 1$.

Alternatively, Buscheck and Alcantar (1995) derived a relationship that allows calculation of first-order decay rate constants for steady-state plumes. This method involves coupling the regression of contaminant concentration (plotted on a logarithmic scale) versus distance downgradient (plotted on a linear scale) to an analytical solution for one-dimensional, steady-state, contaminant transport that includes advection, dispersion, sorption, and biodegradation.

Decay rate constants for Pumphouse 75 were calculated using 1995 TMB and tetraMB data. In addition, three decay constants were calculated using the method of Buscheck and Alcantar (1995). Two constants were calculated using March 1995 data obtained by Parsons ES along two different flow paths, and the third constant was calculated using November 1994 data from BVWS (1995). Calculations are contained in Appendix D. The magnitudes of the calculated rate constants are listed below:

Buscheck and Alcantar (1995) (March 1995 data)	0.00080-0.00085 day ⁻¹
Buscheck and Alcantar (1995) (November 1994 data)	$0.00073~\mathrm{day}^{\cdot 1}$
Total TMB concentrations	0.0006 day ⁻¹
TetraMB concentrations	0.0006 day ⁻¹

A value of 0.0005 day⁻¹ was selected for use as the anaerobic decay coefficient in the model. This value is less than decay constants frequently cited in the literature (Table 5.1), and therefore is potentially conservative. For example, Chapelle (1994) reported that at two different sites with anaerobic conditions, the anaerobic decay rate constants both were approximately 0.01 day⁻¹. Wilson et al. (1994) report first-order anaerobic biodegradation rates of 0.007 to 0.185 day⁻¹. Stauffer et al. (1994) report rate constants of 0.01 and 0.018 day⁻¹ for benzene and p-xylene, respectively. The selected anaerobic decay rate also is less than the rates computed for Site 56 at MacDill AFB (0.003 day⁻¹) (Parsons ES, 1995b) and for a site having similar hydrogeologic conditions at Eglin AFB in Florida (0.009 day⁻¹) (Parsons ES, 1995c).

TABLE 5.1 REPRESENTATIVE FIRST-ORDER RATE CONSTANTS **PUMPHOUSE 75**

INTRINSIC REMEDIATION TS MACDILL AIR FORCE BASE, FLORIDA

Reference	Decay Rate (day ⁻¹)
Chapelle (1994)	0.01 ^{a/}
Buscheck et al. (1993)	0.001 to 0.01 ^a /
Wiedemeier et al. (1996)	0.01 to 0.03 ^{a/}
Wiedemeier et al. (1996)	0.03 to 0.04 ^b /
Wiedemeier et al. (1996)	0.02 to 0.04 ^{c/}
Wiedemeier et al. (1996)	0.01 to 0.03 ^{d/}
Wiedemeier et al. (1996)	0.006 to 0.03 ^{e/}
Stauffer et al. (1994)	0.01 ^b / to 0.02 ^e /
MacIntyre et al. (1993)	0.01 to 0.02 ^e
MacIntyre et al. (1993)	0.007 to 0.012 ^b
MacIntyre et al. (1993)	0.006 to 0.012 ^f
Barker et al. (1987)	0.007 ^{b/}
Kemblowski et al. (1987)	0.008567
Chiang et al. (1989)	0.095 ^{b7}
Wilson et al. (1990)	0.007 to 0.024 ^{b/}
Howard et al. (1991)	0.009 to 0.069 ^b /

a/ For total BTEX.

d/ For ethylbenzene.e/ For xylene.

b/ For benzene.

c/ For toluene.

f/ For naphthalene.

It should be noted that comparison of anaerobic decay rate coefficients with reported values from other sites is most valid if the site geochemical (e.g., redox and pH) conditions are similar. Negative redox values (measured at Pumphouse 75, indicating reducing conditions) were also measured at Site 56, the Eglin AFB site, and at the Hill AFB, Utah site described in Wiedemeier et al., (1996), and each of these sites contained sandy soils. The pH values at Site 56, Eglin AFB, and Hill AFB ranged from 6.2 to 7.3, 5.6 to 6.7, and 6.3 to 8.3, respectively. Measured pH values at Pumphouse 75 ranged from 4.6 to 7.7. Geochemical conditions for the remaining studies listed in Table 5.1 were not specified in the referenced documents.

5.4 MODEL CALIBRATION

Model calibration is an important component in the development of any numerical groundwater model. Calibration of the flow model demonstrates that the model is capable of matching hydraulic conditions observed at the site; calibration of a contaminant transport model superimposed upon the calibrated flow model helps verify that contaminant loading and transport conditions are being appropriately simulated. The numerical flow model presented herein was calibrated by altering transmissivity and recharge in a trial-and-error fashion until simulated heads approximated observed field values within a prescribed accuracy. After calibration of the flow model, the numerical solute transport model was calibrated by altering contaminant transport parameters and contaminant source term concentrations in a trial-and-error fashion until the simulated BTEX plume approximated observed field values. Table 5.2 lists input parameters used for the modeling effort. Model input and output is included in Appendix E.

5.4.1 Water Table Calibration

The shallow water table at Pumphouse 75 was assumed to be influenced by continuous recharge and discharge at the constant-head cells established at the upgradient and downgradient model boundaries. In addition, it was assumed that recharge entered the subsurface in the unpaved portions of the site. Potential recharge from other sources was omitted because of a lack of reliable data. According to BVWS (1995), the average annual precipitation at the Base is approximately 44 inches per year, and the average annual ET rate is 39 inches per year (89 percent of precipitation). The recharge rate for the calibrated groundwater flow model was 3 inches per year. During the calibration process, it was determined that use of higher recharge rates necessitated proportional increases in the transmissivity in order to obtain an acceptable water table simulation.

Hydraulic conductivity is an important aquifer characteristic that represents the ability of the water-bearing strata to transmit groundwater. Transmissivity is the product of the hydraulic conductivity and the thickness of the aquifer. An accurate estimate of hydraulic conductivity is important to help quantify advective groundwater flow velocities and to define the flushing potential of the aquifer and the quantity of electron-acceptor-charged groundwater that is entering the site from upgradient locations. According to Rifai et al. (1988), the Bioplume II model is particularly sensitive to variations in hydraulic conductivity. Lower values of hydraulic conductivity result in a slower-moving plume with a relatively small areal extent and higher average BTEX concentrations. Higher values of hydraulic conductivity result in a faster-moving plume that is spread over a larger area and contains lower average BTEX concentrations.

TABLE 5.2

BIOPLUME II MODEL INPUT PARAMETERS PUMPHOUSE 75

INSTRINSIC REMEDIATION TS MACDILL AIR FORCE BASE, FLORIDA

Parameter	Description	Model Runs			
		Calibrated Model Setup	PH75A	PH75B	PH75C
NTIM	Maximum number of time steps in a pumping period	1	1	1	1
NPMP	Number of Pumping Periods	1	20	16	16
NX	Number of nodes in the X direction	20	20	20	20
NY	Number of nodes in the Y direction	30	30	30	30
NPMAX	Maximum number of Particles	5300	5300	5300	5300
	NPMAX = (NX-2)(NY-2)(NPTPND) + (Nsal)(NPTPND) + 250				
NPNT	Time step interval for printing data	1	1	1	I
NITP	Number of iteration parameters	7	7	7	7
NUMOBS	Number of observation points	5	5	5	5
ITMAX	Maximum allowable number of iterations in ADIP	200	200	200	200
NREC	Number of pumping or injection wells	16	16	16	16
NPTPND	Initial number of particles per node	9	9	9	9
NCODES	Number of node identification codes	3	3	3	3
NPNTMV	Particle movement interval (IMOV)	0	0	0	0
NPNTVL	Option for printing computed velocities	1	1	1	1
NPNTD	Option to print computed dispersion equation coefficients	0	0	0	0
NPDELC	Option to print computed changes in concentration	0	0	0	0
NPNCHV	Option to punch velocity data	0	0	0	0
NREACT	Option for biodegradation, retardation and decay	1	1	1	1
PINT	Pumping period (years)	0.33	1	1	1
TOL	Convergence criteria in ADIP	0.001	0.001	0.001	0.001
FOROS	Effective porosity	0.25	0.25	0.25	0.25
BETA	Characteristic length (long. dispersivity; feet)	40	40	40	40

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TABLE 5.2 (Continued)

BIOPLUME II MODEL INPUT PARAMETERS PUMPHOUSE 75

INSTRINSIC REMEDIATION TS MACDILL AIR FORCE BASE, FLORIDA

S	Storage Coefficient	Model Runs			
		0 (Steady- State)	0	0	0
TIMX	Time increment multiplier for transient flow	-	-	-	-
TINIT	Size of initial time step (seconds)	•	-	-	-
XDEL	Width of finite difference cell in the x direction (feet)	30	30	30	30
YDEL	Width of finite difference cell in the y direction (feet)	40	40	40	40
DLTRAT	Ratio of transverse to longitudinal dispersivity	0.025	0.025	0.025	0.025
CELDIS	Maximum cell distance per particle move	0.5	0.5	0.5	0.5
ANFCTR	Ratio of Tyy to Txx (1 = isotropic)	1	1	1	1
DK	Distribution coefficient	0.047	0.047	0.047	0.047
RHOB	Bulk density of the solid (grams/cubic centimeter)	1.6	1.6	1.6	1.6
THALF	Half-life of the solute	•	•	-	-
DEC1	Anaerobic decay coefficient (day 1)	0.0005	0.0005	0.0005	0.0005
DEC2	Reseration coefficient (day')	0	0	0	0
F	Stoichiometric Ratio of Hydrocarbons to Oxygen	3.1	3.1	3.1	3.1

Ns - Number of nodes that represent fluid sources (wells or constant-head cells).

b/ ADIP = Alternating-direction implicit procedure (subroutine for solving groundwater flow equation).

Saturated thickness data from previous reports, geologic logs, and water level measurements were used in conjunction with the average hydraulic conductivity as determined from slug tests (BVWS, 1995 and this field effort) to estimate an initial uniform transmissivity for the entire model domain. As stated in Section 3.5, hydraulic conductivities derived from slug tests performed in the shallow sandy aquifer at Pumphouse 75 ranged from 5.2 to 90.7 ft/day. To better match heads in the model to observed values, the transmissivities were progressively varied in blocks and rows until the simulated water levels for cells corresponding to the selected well locations matched the observed water levels to an acceptable degree. Figure 5.2 shows the calibrated water table. Calibrated model hydraulic conductivities ranged between 1 and 114 ft/day, with the majority of conductivities ranging between 14 and 114 feet per day. Simulated advective velocities were variable, but generally ranged from 0.10 ft/day to 0.26 ft/day (36 to 95 feet per year). These velocities are slightly higher than the average velocity of 0.06 ft/day (22 feet per year) estimated prior to the start of the modeling using BVWS (1995) data.

Water level elevation data from 16 monitoring well/point locations were used to compare measured and simulated heads for calibration. The 16 selected locations were MD75-MW01, MD75-MW02, MD75-MW03, MD75-MW04, MD75-MW05, MD75-MW06, MD75-MW08, MD75-MW09, MD75-MW10, MD75-MW12, MD75-MW13, MD75-MW15, 75MP-1S, 75MP-8S, AND 75MP-9S.

The root mean squared (RMS) error is commonly used to express the average difference between simulated and measured heads. RMS error is the average of the squared differences between measured and simulated heads, and can be expressed as:

RMS =
$$\left[\frac{1}{n}\sum_{i=1}^{n}(h_{m}-h_{s})_{i}^{2}\right]^{0.5}$$

where:

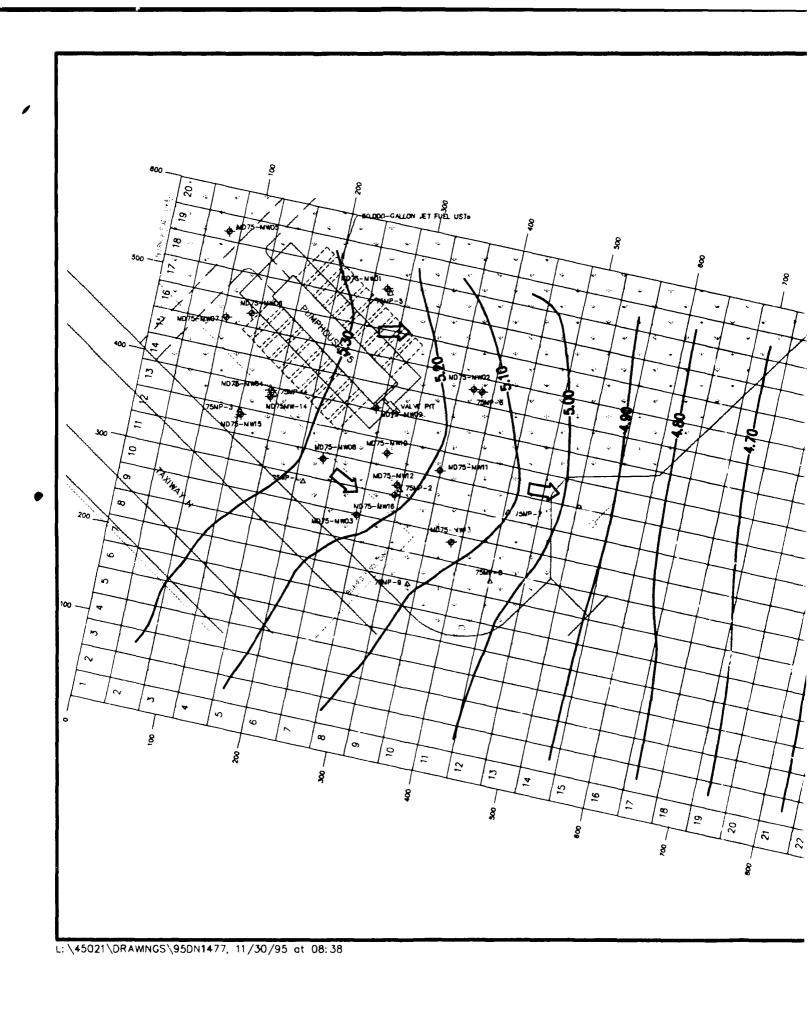
n = the number of points where heads are being compared,

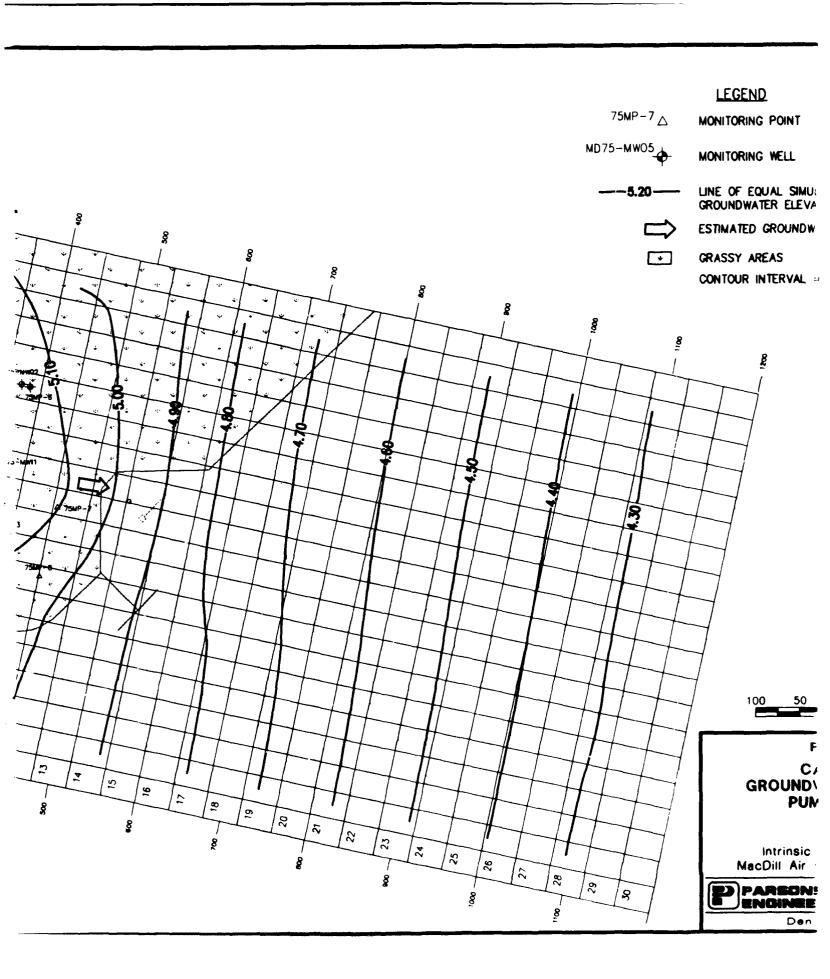
 h_m = measured head value, and

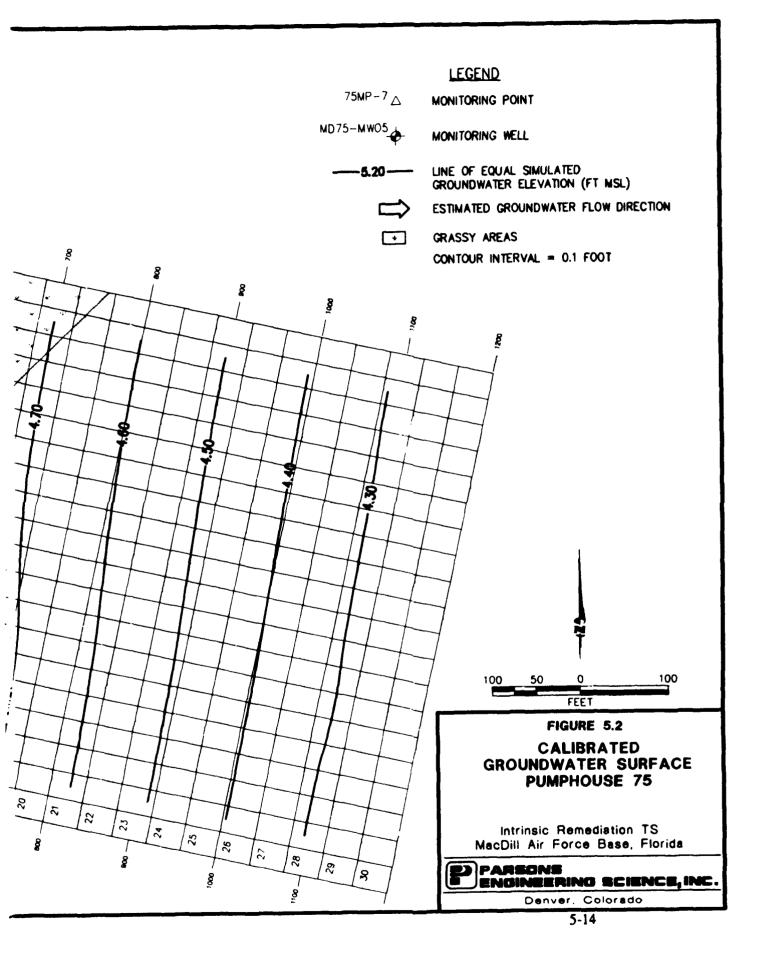
 h_{\star} = simulated head value.

The RMS error between observed and calibrated values at the 16 comparison points was 0.024 foot, which corresponds to a calibration error of 2.2 percent (water levels dropped approximately 1.1 feet over the length of the model grid). RMS error calculations are summarized in Appendix D.

In solving the groundwater flow equation, Bioplume II establishes the water table surface and calculates an overall hydraulic balance that accounts for the numerical difference between flux into and out of the system. The hydraulic mass balance for the calibrated model was adequate to accomplish the objectives of this modeling effort, with 98.02 percent of the water flux into and out of the system being numerically accounted for (i.e., a 1.98-percent error). According to Anderson and Woessner (1992), a mass balance error of around 1 percent is acceptable, while Konikow (1978) indicates an error of less than 0.1 percent is ideal.









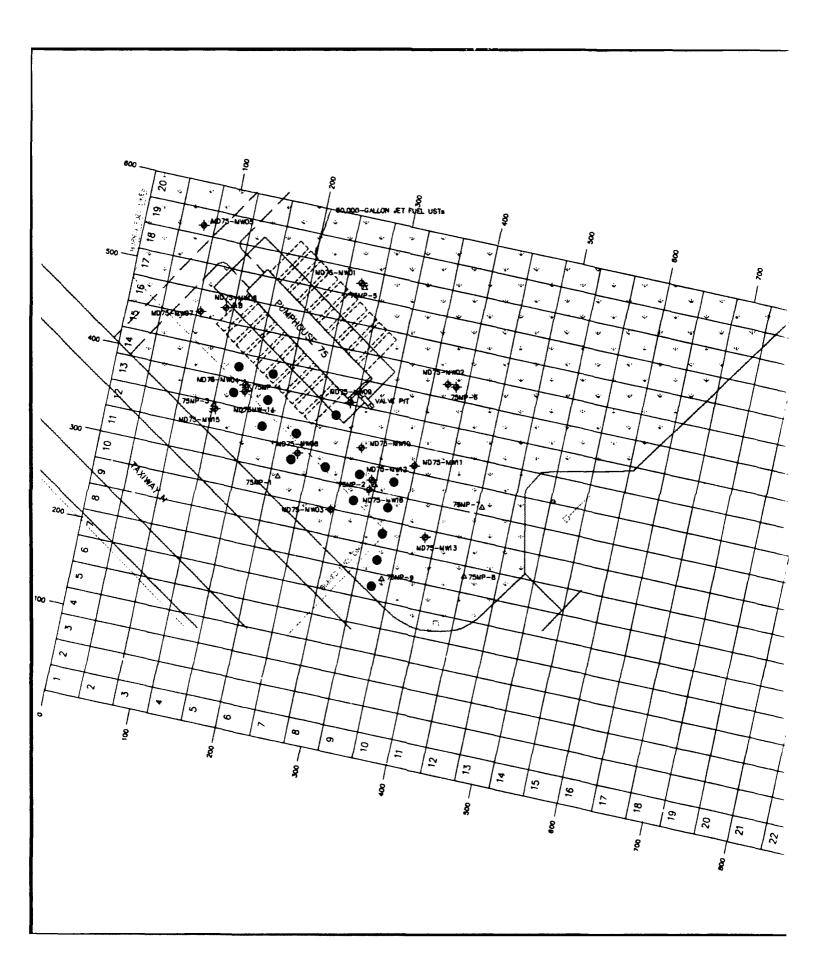
5.4.2 BTEX Plume Calibration

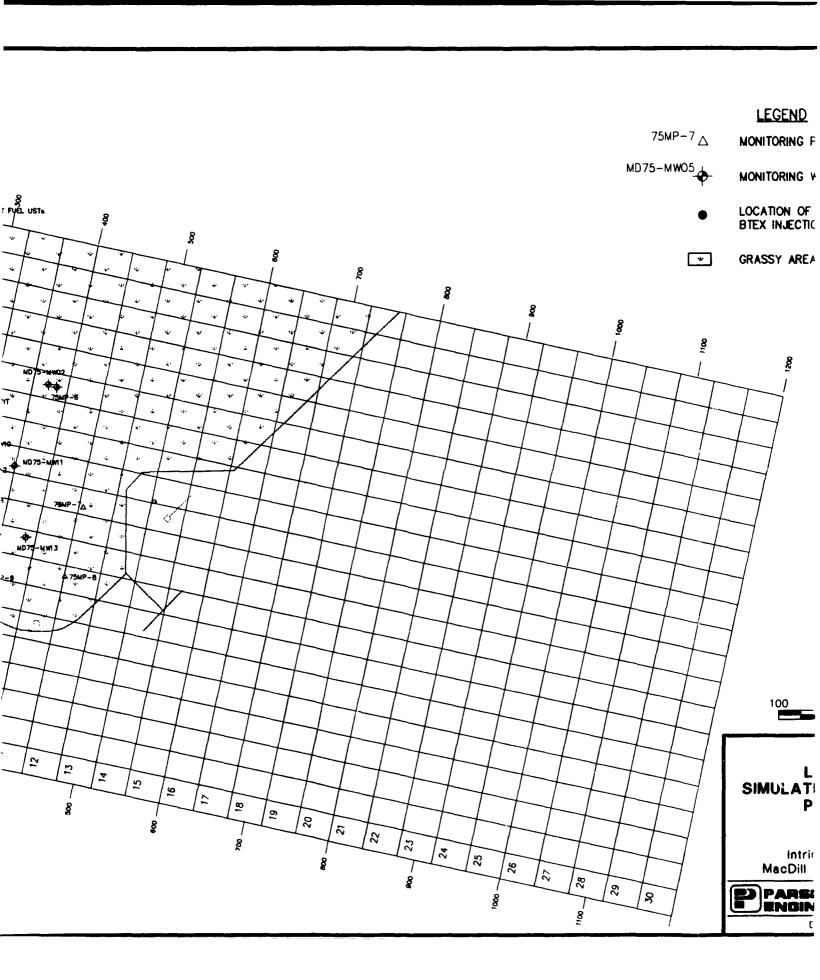
Model input parameters affecting the distribution and concentration of the simulated BTEX plume were modified so that model predictions were similar to dissolved total BTEX concentrations measured in March 1995. To do this, model runs were made using the calibrated steady-state hydraulic parameters. Calibration of the fate and transport portion of a Bioplume II model generally requires that the contaminant distribution be known for two different times. Therefore, BTEX concentrations measured in groundwater during November 1994 were input as initial conditions, and the model was run for a period of 4 months to obtain a March 1995 plume. In addition, because residual LNAPL is present in the vicinity of the water table at Pumphouse 75 (Section 4.2.2), it was necessary to include simulated injection wells to model partitioning of BTEX compounds from the residual LNAPL into the groundwater. The locations of the injection wells are shown on Figure 5.3. Locations of injection wells were based on the soil quality data obtained by BVWS (1995) and Parsons ES (Section 4.2.2). In addition, the distribution of dissolved BTEX in groundwater also was used to help locate injection wells. The groundwater quality data strongly suggest that the most significant soil contamination is present in the vicinity of the jet fuel pipelines located southwest of the pumphouse, and that any soil contamination in the immediate vicinity of the USTs is not substantially impacting groundwater quality. Therefore, the majority of injection wells in the model were placed near the pipelines.

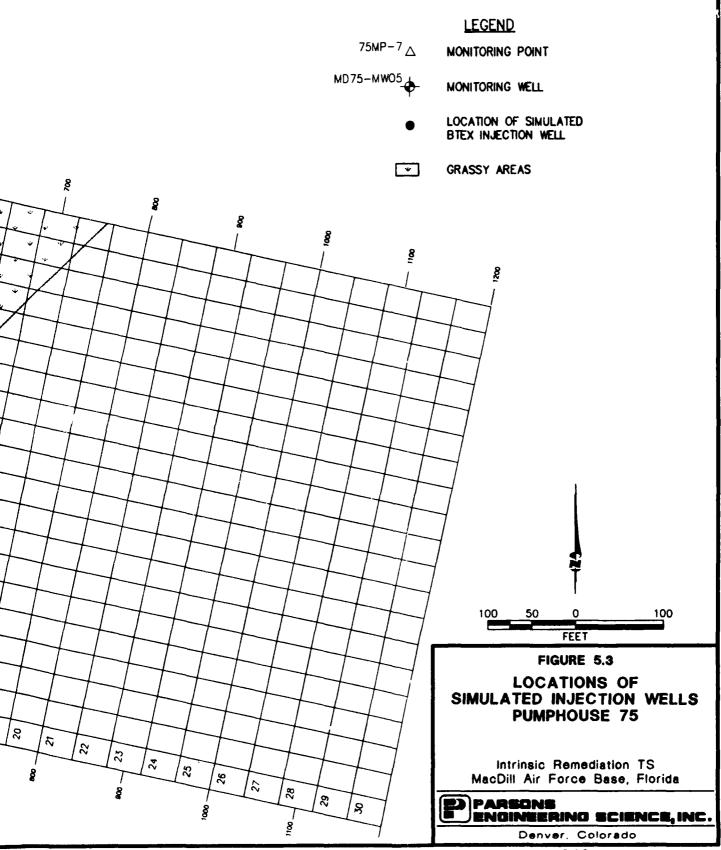
While the term "injection well" suggests that contaminants are being introduced at a point, Bioplume II assumes that contamination introduced at a well instantly equilibrates throughout the entire cell in which the well is located. The injection rate for the cells was set at 1×10^{-6} cubic foot per second (ft³/sec), a value low enough that the flow calibration and water balance were not affected. The injected BTEX concentrations were proportional to the groundwater BTEX concentrations measured in March 1995, with the maximum injected BTEX concentration occurring in the vicinity of the highest detected dissolved BTEX concentrations. The injected BTEX concentrations were reduced in other areas where the measured BTEX concentrations in groundwater were lower. Due to the low DO concentrations measured in groundwater, the injected water was assumed to be oxygen-free. By varying the injection well concentrations, the anaerobic decay coefficient, the coefficient of retardation, and dispersivity, the BTEX plume was calibrated reasonably well to the existing plume in terms of plume extent and the magnitude and distribution of BTEX concentrations in the plume area. The calibrated plume configuration is shown on Figure 5.4.

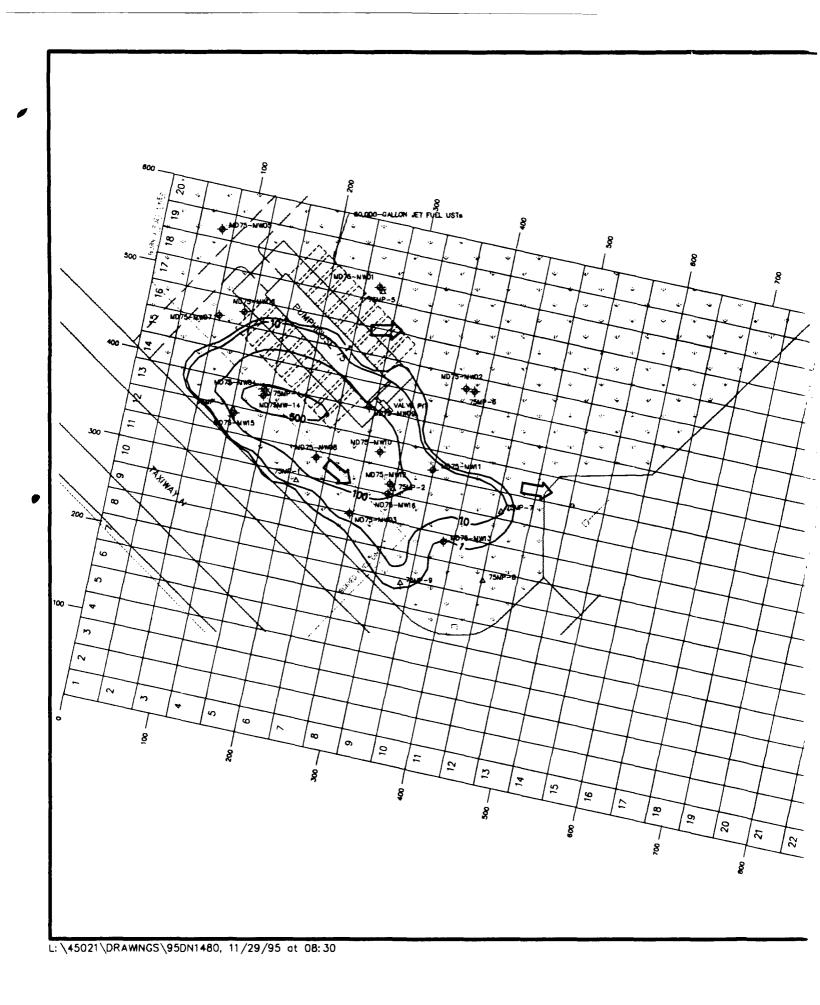
The calibrated BTEX plume calculated by the model is similar, but not identical, to the observed March 1995 BTEX plume (Figure 4.3). The following differences are observed:

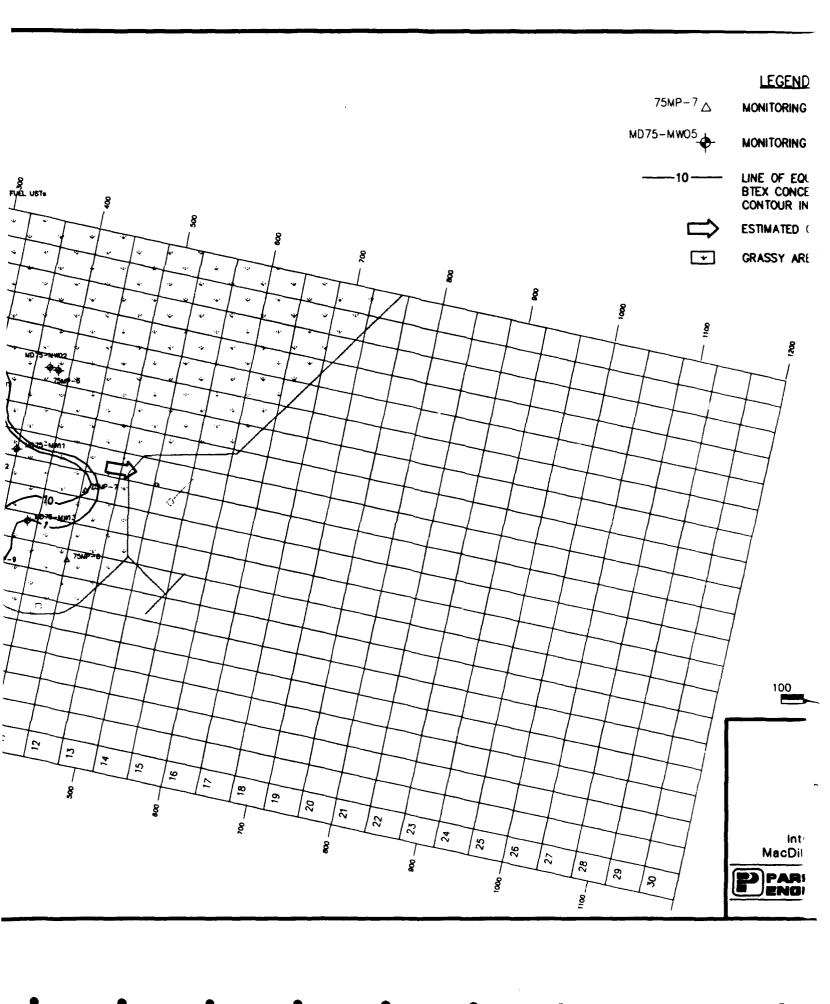
• The width of the simulated plume (i.e., the distance between the 10-µg/L contour lines measured in a northeast-southwest direction) is greater than measured in March 1995. This difference can be attributed primarily to the fact that the BTEX plume measured in November 1994, and used as initial conditions in the model, appeared to be wider than the plume measured in March 1995. This difference could not be overcome by reasonable manipulation of contaminant transport parameters. As a result, the simulated plume contains a greater contaminant mass than the measured March 1995 plume, and this difference contributes to the conservative nature of the model.

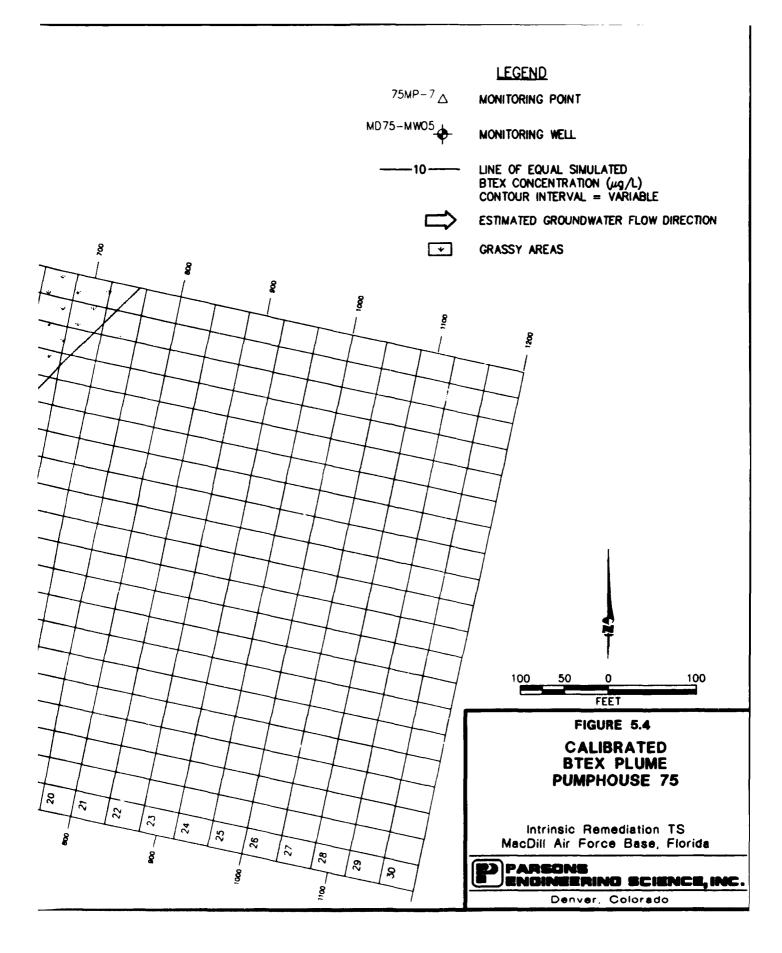












• Low (less than 5 μg/L) BTEX concentrations were measured at several outlying wells located north and east of the pumphouse in March 1995 (Figure 4.3). Despite the low crossgradient DO concentrations used in the model, these low BTEX concentrations fringing the plume could not be reproduced by manipulation of contaminant transport parameters within reasonable limits. Therefore, the detected concentrations may be resulting from relatively minor amounts and low concentrations of soil contamination in the vicinity of the USTs. Due to the low magnitude of the concentrations however, this difference is considered to be relatively insignificant. In addition, laboratory methodblanks associated with most of these northern and eastern sampling locations also had detectable BTEX concentrations (Table 4.3), suggesting that the detected BTEX concentrations in the environmental samples may, at least in part, reflect laboratory-introduced contamination.

5.4.2.1 Discussion of Parameters Varied During Plume Calibration

As noted previously, the transport parameters varied during plume calibration were dispersivity, the anaerobic decay coefficient, and the coefficient of retardation. In addition, the BTEX source term injection concentrations were varied. These parameters generally were varied with intent of limiting plume migration to the observed extents, because the original estimates for the parameters resulted in a calculated BTEX plume that did not reasonably reproduce the original plume. In general, slight to moderate variations of these parameters did not affect the plume substantially due to the short (4-month) calibration period. If the calibration period had been longer, there would have been more time for the parameter adjustment to have a noticeable effect on the model results. However, some variations in plume configuration were observed during the calibration process.

Dispersivity. Much controversy surrounce the concepts of dispersion and dispersivity. Longitudinal dispersivity was originally estimated as 7 feet, using one-tenth the distance between the upgradient margin of the 500-µg/L isopleth and the longitudinal centroid of the March 1995 plume (see Figure 4.3). Longitudinal dispersivity also was determined, using a method presented by Domenico and Schwartz (1990), to be approximately 79 feet. During plume calibration, longitudinal dispersivity was varied between 14 and 60 feet, and the calibrated model used a value of 40 feet. During the calibration process, the model was found to be relatively insensitive to changes in dispersivity (changes in this parameter did not have a significant impact on the distribution of BTEX concentrations). Transverse dispersivity values typically are estimated as one-tenth (0.1) of the longitudinal dispersivity values (Domenico and Schwartz, 1990). However, because the 1995 plume was relatively narrow, the ratio of transverse to longitudinal dispersivity was reduced to 0.025.

Anaerobic Decay Coefficient. As discussed in Section 5.3.5, the anaerobic decay coefficient was originally estimated to range from 0.0004 to 0.00085 day⁻¹. This value was varied within this range during plume calibration, and the calibrated model used a value of 0.0005 day⁻¹. The model was found to be relatively insensitive to small changes in the decay coefficient within the 4-month calibration period from November 1994 to March 1995. The value of 0.0005 day⁻¹ used in the calibrated model is believed to be reasonably conservative, as described in Section 5.3.5.

Coefficient of Retardation. Retardation of the BTEX compounds relative to the advective velocity of the groundwater occurs when BTEX molecules are sorbed to organic carbon, silt, or clay in the aquifer matrix. TOC was not detected in the three soil samples analyzed for this

parameter (Table 4.2); therefore, site-specific retardation coefficients were not calculated. The lack of detectable quantities of TOC suggests that retardation of the dissolved BTEX plume may be minimal. TOC was detected in six of seven samples collected from the surficial sand aquifer at two other sites at the Base (Site 56 and OT 24), with concentrations ranging from 0.10 to 2.68 percent. On the basis of these TOC concentrations, retardation coefficients for benzene, which is the least retarded of the BTEX compounds, ranged from 1.0 to 10.1. It is probable that some retardation of the dissolved BTEX plume at Pumphouse 75 will occur at and/or downgradient from the site along the plume flowpath. Therefore, a low retardation coefficient of 1.3 was used in the calibrated model. This is the value that would be obtained for benzene assuming an average TOC content of 0.06 percent (the detection limit for this study), a bulk density of 1.6 grams per cubic centimeter (g/cc) (Freeze and Cherry, 1979), and published values of the soil sorption coefficient (K_{oc}) for the BTEX compounds (as compiled by Wiedemeier et al., 1995). The lower the assumed coefficient of retardation, the farther the BTEX plume will migrate downgradient. The calibrated flow and transport model subsequently was used to simulate plume migration for a period of 20 years using slightly lower retardation values to determine whether small changes in this value significantly affected model predictions. The results of these simulations are discussed in Section 5.6.1.

Source Injection Concentration. Sixteen injection wells were used to simulate the partitioning of BTEX from contaminated soil in the vicinity of the plume. The water injection rate (1x10⁻⁶ ft³/sec) was sufficiently low that the calibrated flow system was not altered. The injected BTEX concentrations were varied until the calibrated plume matched measured conditions reasonably well. The detected BTEX concentrations are highest in the immediate vicinity of monitoring well MD75-MW04, suggesting that the most significant soil contamination is located in this area. During the calibration process, it became evident that maintenance of relatively high BTEX injection concentrations in this area were necessary to simulate the measured dissolved BTEX concentration in well 75MD-MW04.

5.5 SENSITIVITY ANALYSIS

The purpose of the sensitivity analysis is to determine the effect of varying model input parameters on model output. According to Rifai et al. (1988), the Bioplume II model is most sensitive to changes in the coefficient of reaeration, the coefficient of anaerobic decay, and the hydraulic conductivity of the media, and is less sensitive to changes in the retardation factor, porosity, and dispersivity. The sensitivity analysis was conducted by varying transmissivity, the coefficient of retardation, the coefficient of anaerobic decay, dispersivity, and BTEX injection concentrations. The coefficient of reaeration was not included in the sensitivity analyses because it was set to zero in the model.

To perform the sensitivity analyses, the calibrated model was adjusted by systematically changing the aforementioned parameters individually, and then comparing the new simulations to the results of the original calibrated model. The models were run for a 0.33-year period, just as the original was, so that the independent effect of each variable could be assessed. Ten sensitivity runs of the calibrated model were made, with the following variations:

- 1) Transmissivity uniformly increased by a factor of 5;
- 2) Transmissivity uniformly decreased by a factor of 5;
- 3) Coefficient of retardation increased from 1.3 to 3.0:

- 4) Coefficient of retardation decreased from 1.3 to 1.0 (no retardation);
- 5) Coefficient of anaerobic decay increased by a factor of 5;
- 6) Coefficient of anaerobic decay decreased by a factor of 5;
- 7) Dispersivity increased by a factor of 3;
- 8) Dispersivity decreased by a factor of 3;
- 9) Injected BTEX concentrations increased by a factor of 5; and
- 10) Injected BTEX concentrations decreased by a factor of 5.

The results of the sensitivity analyses are shown in Figures 5.5 through 5.9. These figures display three-dimensional representations of modeled BTEX concentrations. The vertical axis of each three-dimensional figure represents the BTEX concentration in $\mu g/L$. With the exceptions of transmissivity and the injected BTEX concentrations, parameter modification did not greatly affect the plume, in part because the calibration period was short (4 months). More significant differences may have been apparent if a longer time period had been simulated. However, the sensitivity analyses do indicate how variations in key hydraulic and transport parameters affect the BTEX plume.

5.5.1 Sensitivity to Variations in Transmissivity

The effects of varying transmissivity are shown in Figure 5.5. Uniformly increasing the transmissivity by a factor of five increased the lateral dispersal of the plume such that the maximum observed concentrations in the source cell area were only 252 μ g/L, compared to the calibrated maximum of 703 μ g/L. In addition, the leading edge of the BTEX plume advanced more than 100 feet further downgradient than in the calibrated model. The faster groundwater velocity produced by the higher transmissivity initially results in greater plume travel rates and distances, diluting and further exposing the BTEX plume to electron acceptors.

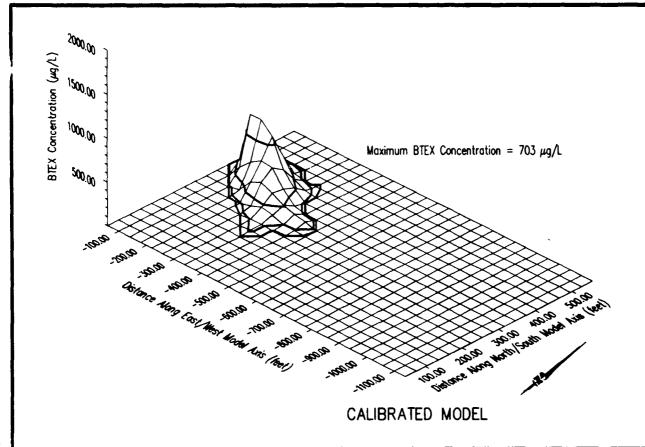
In contrast, decreasing the transmissivity by a factor of five slowed overall plume migration, caused the plume shape to be relatively irregular and lobate, and caused an increase in maximum BTEX levels to 1,556 μ g/L. Increased BTEX concentrations in the plume area are primarily caused by reductions in the plume travel rate (i.e., the existing BTEX mass is concentrated within a smaller area).

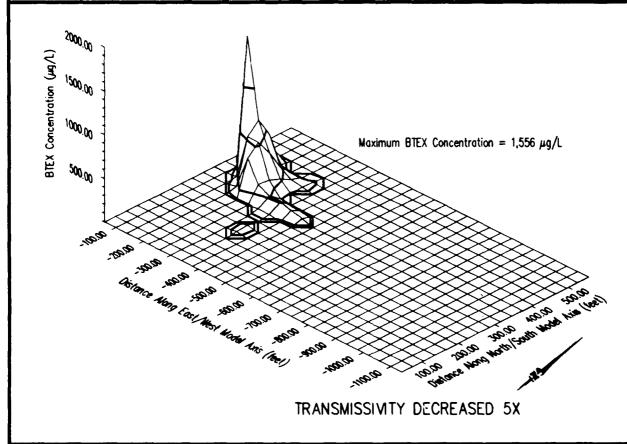
5.5.2 Sensitivity to Variations in the Coefficient of Retardation

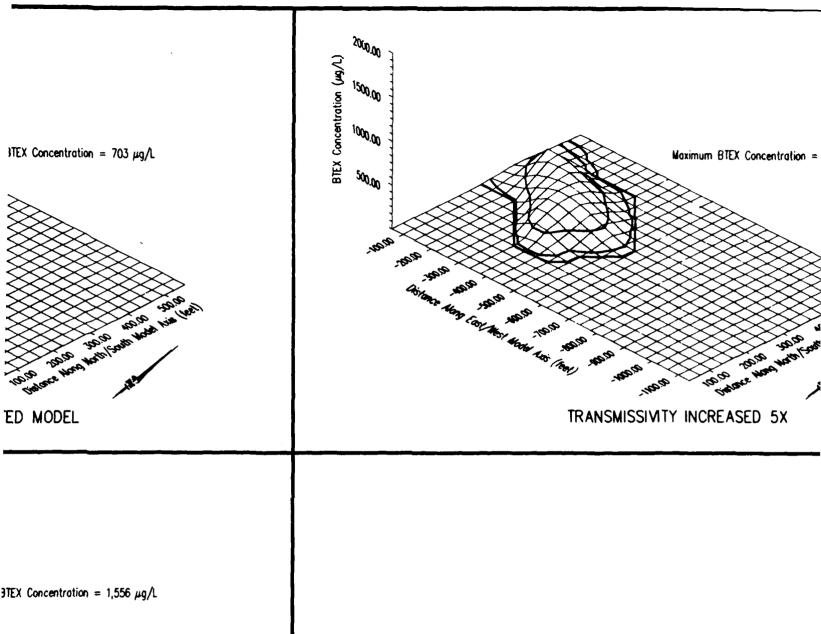
The effects of varying the coefficient of retardation (R) are shown on Figure 5.6. Increasing R to 3.0 from the value of 1.3 used in the calibrated model resulted in a plume configuration that was not greatly different from the observed plume. In addition, the maximum BTEX concentration of 714 μ g/L was very similar to the maximum calibrated concentration of 703 μ g/L. Increasing R causes the contaminant migration velocity to decrease relative to the advective groundwater velocity. One difference that was noted was that the downgradient portion of the plume simulated using the higher R value was narrower than the observed plume, and the modeled plume did not reach monitoring point 75MP-9, where BTEX was detected. Decreasing R to 1.0 (no retardation) also produced a plume that

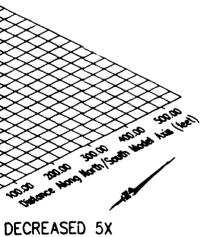


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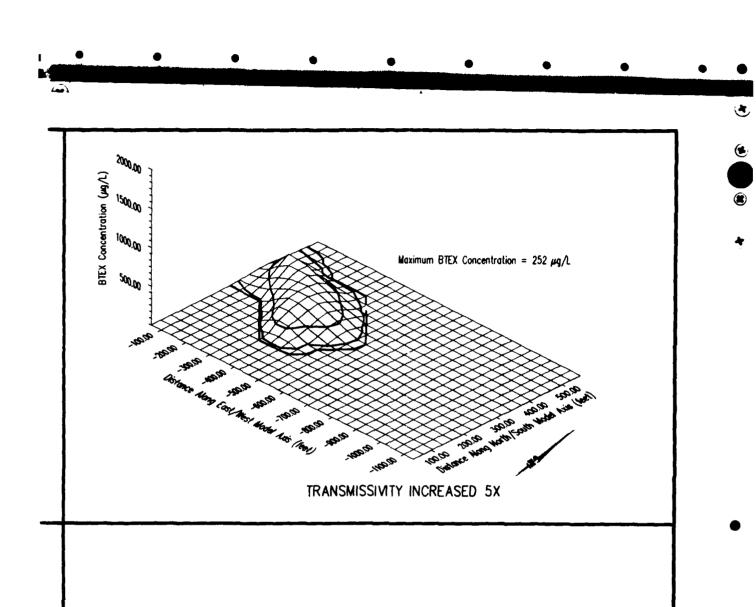


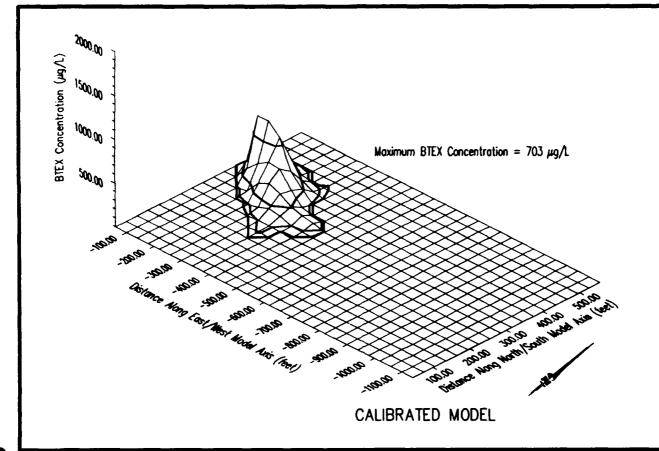
FIGURE 5.5

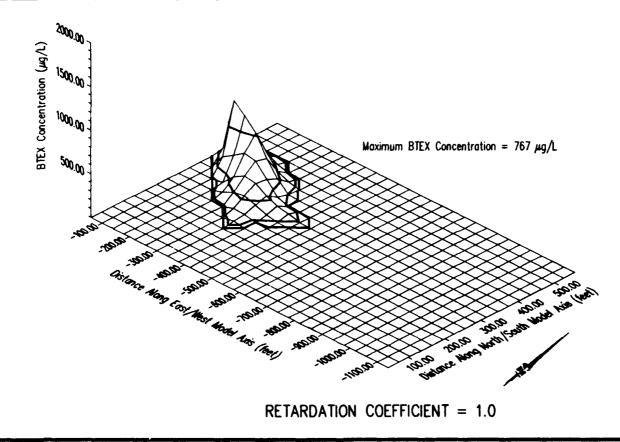
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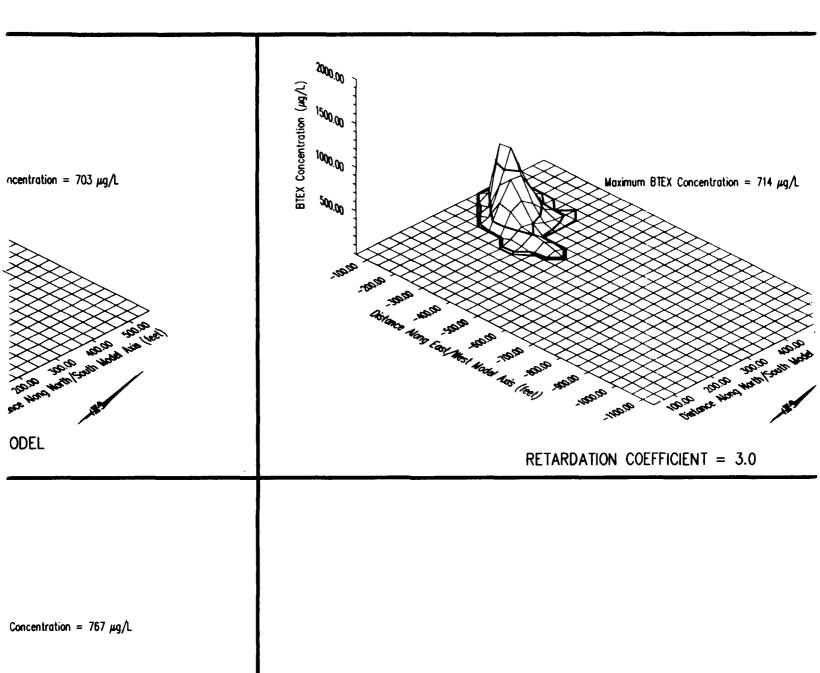
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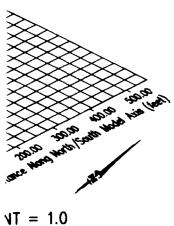
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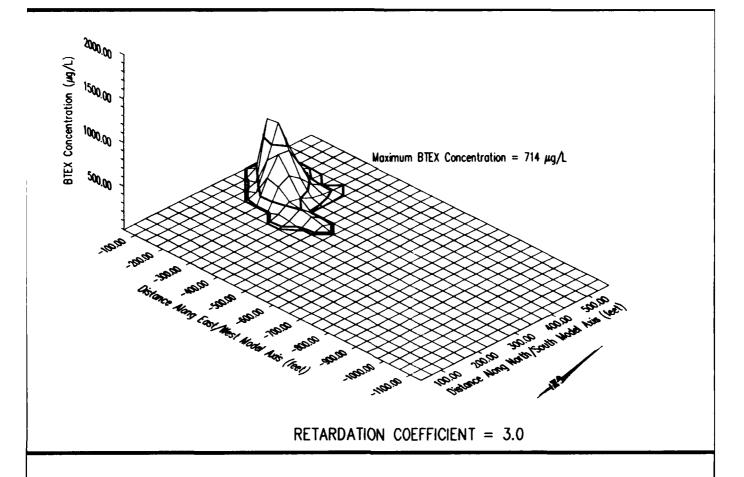


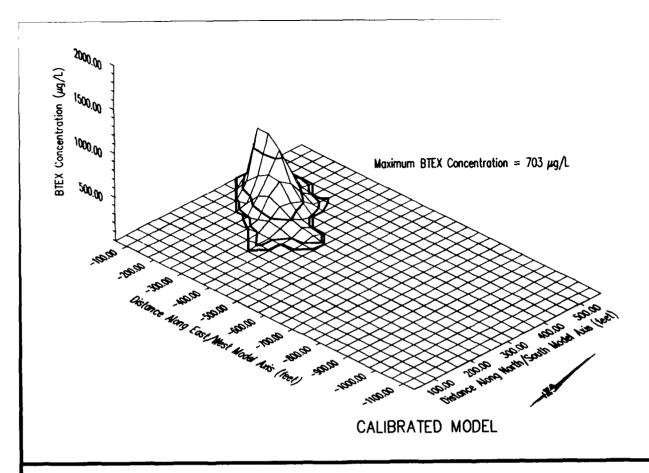
FIGURE 5.6

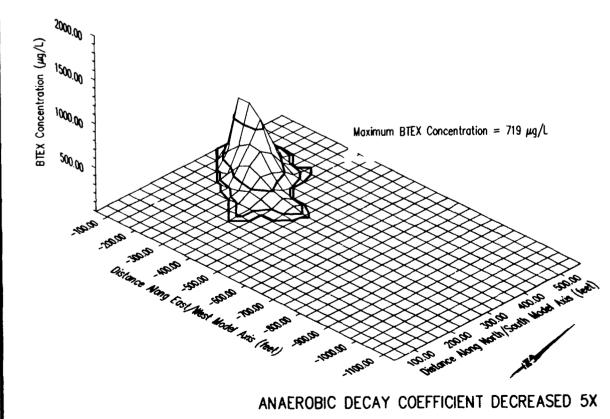
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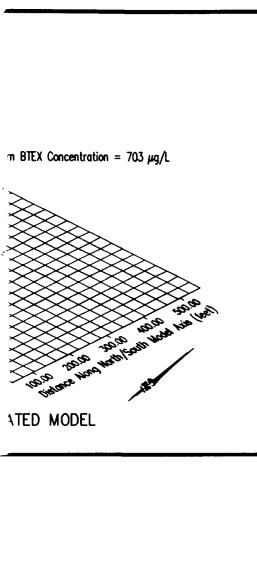
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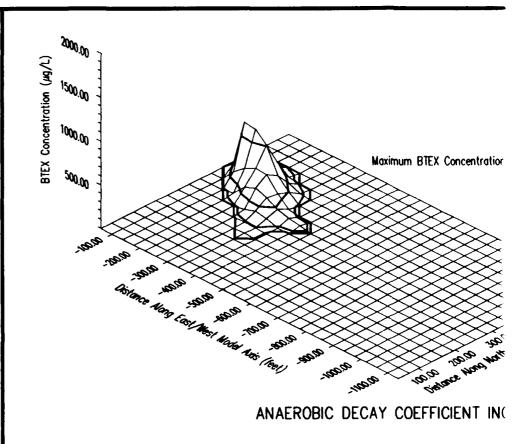
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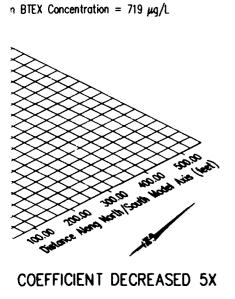
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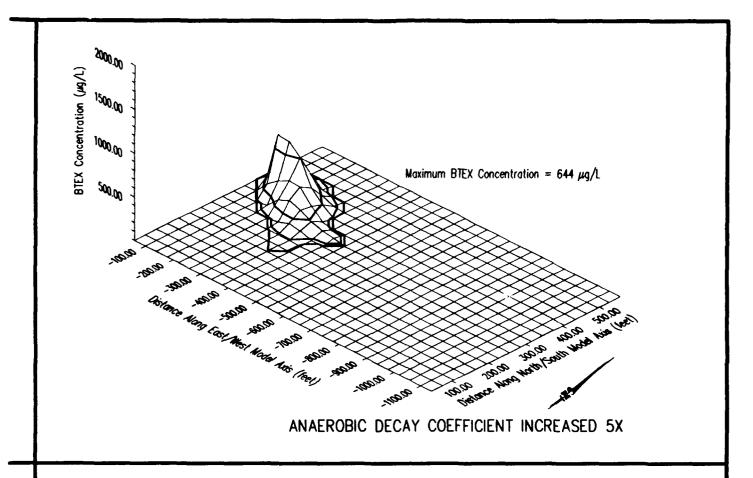


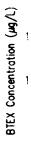
FIGURE 5.7

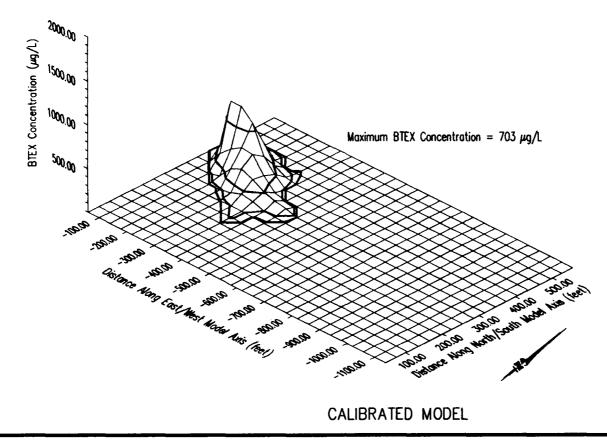
MODEL SENSITIVITY TO VARIATIONS IN ANAEROBIC DECAY COEFFICIENT PUMPHOUSE 75

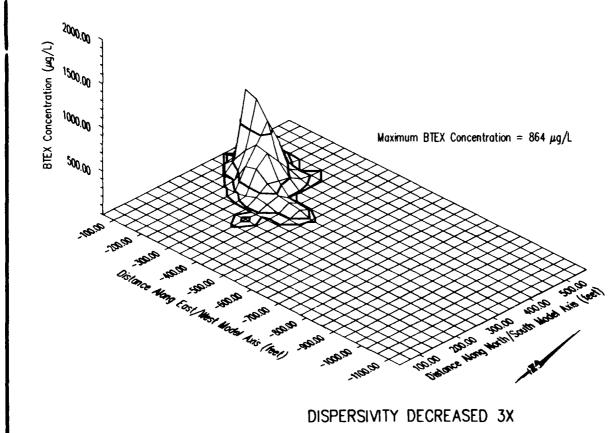
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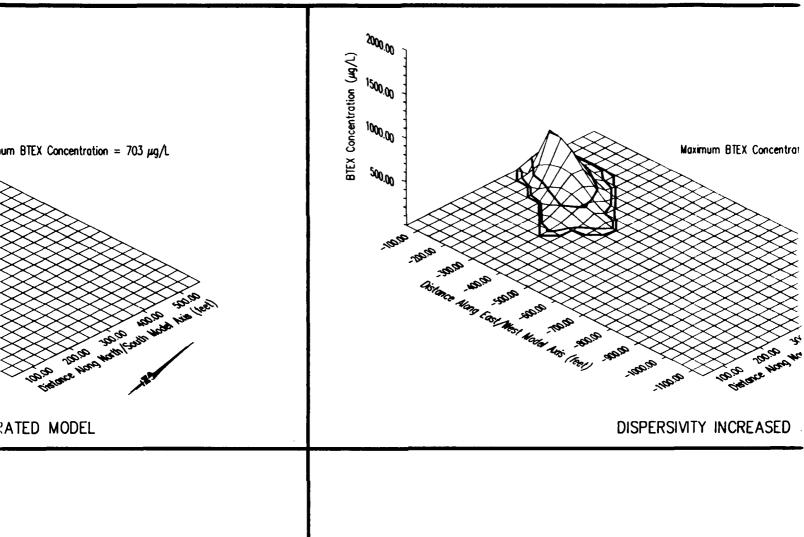
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ximum BTEX Concentration = $864 \mu g/L$

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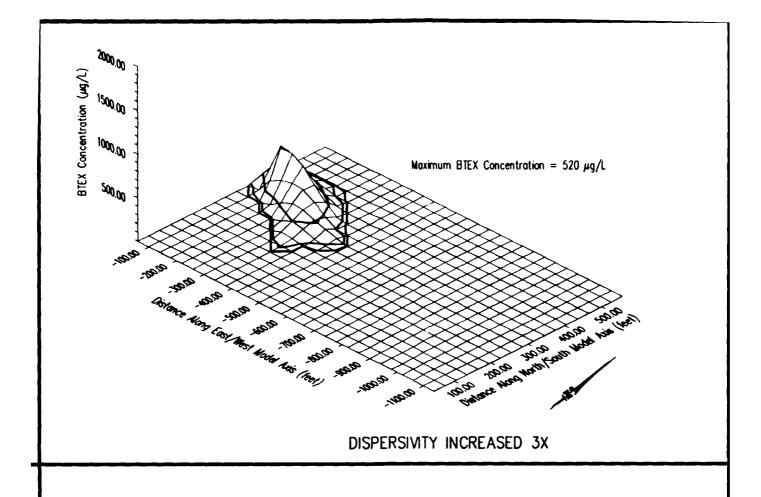


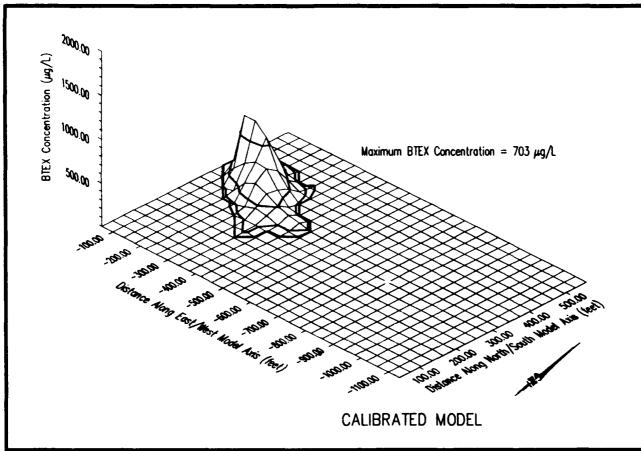
FIGURE 5.8

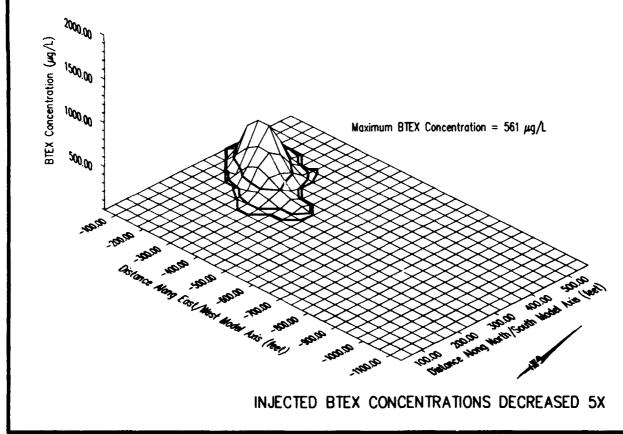
MODEL SENSITIVITY TO VARIATIONS IN DISPERSIVITY PUMPHOUSE 75

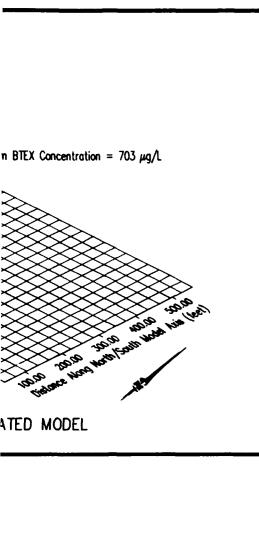
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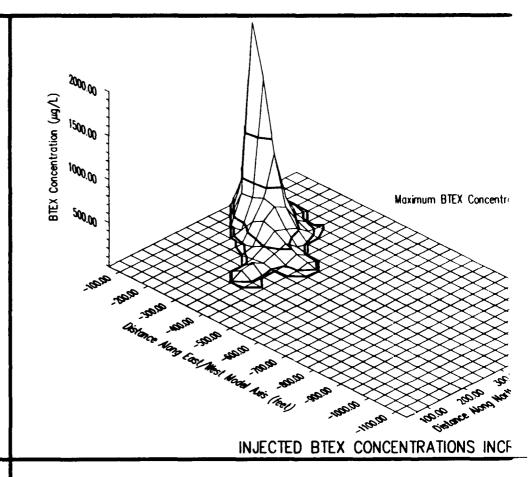
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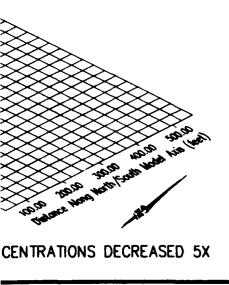
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BTEX Concentration = $561 \mu g/L$



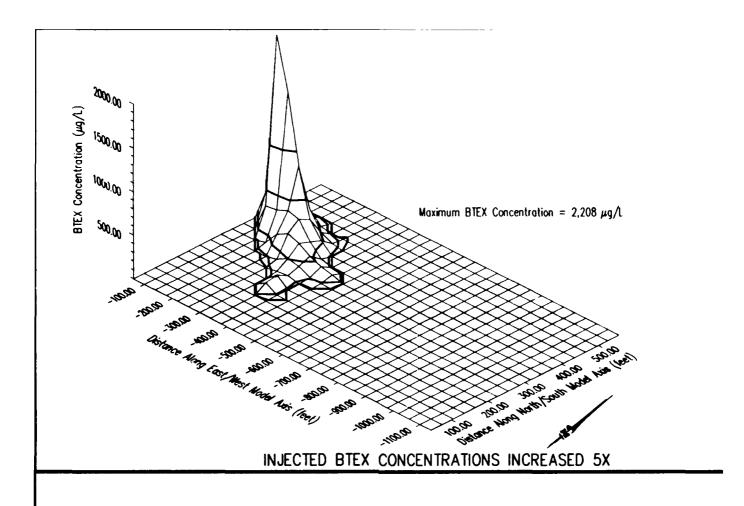


FIGURE 5.9

MODEL SENSITIVITY TO VARIATIONS IN BTEX INJECTION CONCENTRATIONS PUMPHOUSE 75

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was similar to the calibrated model plume, but that extended approximately 25 feet further downgradient. The maximum BTEX concentration in the source area of the unretarded plume was slightly elevated (767 μ g/L). The similarity between the unretarded and calibrated plumes can be attributed primarily to the low R value of 1.3 used in the calibrated model. Based on these analyses, the selected R value of 1.3 appears to be reasonably conservative.

5.5.3 Sensitivity to Variations in the Coefficient of Anaerobic Decay

Figure 5.7 shows the effects of varying the anaerobic decay coefficient. Increasing this parameter by a factor of five results in more rapid degradation of dissolved BTEX. The reduction in contaminant mass is the result of the relatively large increase in the decay rate caused by increasing the coefficient, because the anaerobic decay coefficient is exponentiated in the equation expressing the decay rate (see Section 5.3.5). Still, the resulting BTEX plume is very similar to the calibrated plume due to the short (4-month) calibration time and the fact that anaerobic decay in the model is rate-limited rather than instantaneous. As a result, there was not sufficient time for the anaerobic decay reactions to significantly affect BTEX concentrations. In addition, the small magnitude of the calibrated decay coefficient (0.0005 day⁻¹) meant that multiplying and dividing this value by a factor of five resulted in values that were not greatly different in magnitude than the calibrated value. However, the tested range (0.0001 to 0.0025 day-1) represents a feasible range of decay coefficients for the Pumphouse 75 site on the basis of available data. Two differences in the plume simulated using the larger decay coefficient were that contaminant concentrations in the vicinity of monitoring point 75MP-9 were reduced over those actually measured in the field, and the maximum source area dissolved BTEX concentration decreased from 703 µg/L to 644 µg/L, which is below the measured maximum value of 676 µg/L. Therefore, use of a lower decay coefficient contributes to the conservative nature of the model.

Conversely, decreasing the anaerobic decay coefficient by a factor of five decreases the rate of degradation, resulting in a slight overall increase in the computed BTEX concentrations to levels that were slightly above observed concentrations. Again, however, as a result of the short duration of the calibration period and the low magnitude of the anaerobic decay rate, the BTEX plume simulated using the lower decay rate is very similar to the calibrated plume. This sensitivity analysis indicates that the model is not extremely sensitive to relatively small variations in the anaerobic decay coefficient over the short term. The value used in the calibrated model is reasonably conservative based on comparisons with decay values computed for other sites (Section 5.3.5), and adequately simulates the measured March 1995 plume.

5.5.4 Sensitivity to Variations in Dispersivity

The effects of varying dispersivity are illustrated in Figure 5.8. Both longitudinal and transverse dispersivity were varied for this analysis, as the ratio of the two values was kept constant at 0.025. Increasing the dispersivity by a factor of three resulted in a relatively low maximum BTEX concentration in the source area (520 μ g/L), and an increase in concentrations upgradient from the source area above observed concentrations. In addition, there was a slight spreading of the plume longitudinally, and the areal extent of dissolved BTEX concentrations greater than 500 μ g/L was substantially reduced. The results of this analysis indicate that the increased dispersivity produces a plume that does not match the measured plume as well as the dispersivity value used by the calibrated model. Decreasing dispersivity by a factor of three produced a plume with an areal extent similar to the calibrated plume, but with higher concentrations (maximum BTEX concentration of 864 μ g/L). In

addition, the plume shape was relatively irregular, departing from the more elliptical shape of he measured plume. Based on these analyses, the model appears to be moderately sensitive to variations in dispersivity of this magnitude, and the value of 40 feet used in the calibrated model appears to be reasonable.

5.5.5 Sensitivity to Variations in Injected BTEX Concentrations

The results of increasing and decreasing the injected BTEX concentrations by a factor of five are shown on Figure 5.9. Increasing the injected concentrations by a factor of five more than triples the maximum plume concentration to 2,208 μ g/L, and generally increases BTEX concentrations in the vicinity of monitoring well MD75-MW04 and monitoring point 75MP-9 over those measured in the field. Decreasing the injected BTEX concentrations by a factor of five decreases the maximum concentration by 142 μ g/L to 561 μ g/L, and substantially decreases the area bounded by the 500- μ g/L isopleth relative to the calibrated model. In addition, dissolved BTEX concentrations near monitoring point MP75-9 are reduced by an excessive amount. Based on these analyses, the model appears to be moderately to very sensitive to variations in injected BTEX concentrations of this magnitude, and the values used in the calibrated model appear to be reasonable.

5.5.6 Summary of Sensitivity Analysis Results

The results of the sensitivity analysis suggest that the calibrated model used for this report is reasonable. The calibrated model is most sensitive to variations in transmissivity and BTEX injection concentrations. Increasing or decreasing the transmissivity substantially diminishes or enhances the simulated BTEX concentrations, and lengthens or shortens the plume relative to the plume configuration measured in March 1995. Simulated BTEX concentrations in the vicinity of well MD75-MW04, located near what appears to be the primary contaminant source area, are significantly affected by variations in BTEX injection concentrations. The sensitivity analysis results indicate that increasing or decreasing these concentrations by a factor of five would increase or decrease maximum dissolved BTEX concentrations to an unacceptable degree, and therefore the concentrations used in the calibrated model appear to be reasonable.

Relatively minor effects on the plume configuration are obtained when the retardation coefficient, anaerobic decay coefficient, and dispersivity are varied within reasonable ranges. The values used in the calibrated model are believed to be conservative, and reasonable changes in these values would most likely not improve the model calibration significantly. The sensitivity analysis results suggest that the use of a larger retardation factor would improve the calibration by narrowing the plume. The value used in the model was intentionally conservative for representing total BTEX migration. The selected value is most representative of benzene in order to more effectively simulate the migration of this compound (which typically poses the most risk to potential receptors) to a greater degree than the other BTEX compounds.

5.6 MODEL RESULTS

To predict fate and transport of dissolved BTEX compounds at the Pumphouse 75 site, three Bioplume II simulations (PH75A, PH75B, and PH75C) were run using the calibrated, steady-state groundwater flow system. The first simulation (PH75A) assumed that the rates at which the BTEX compounds were introduced into the aquifer through injection wells decreased by 15

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percent per year (injected BTEX concentrations were decreased by 15 percent from the concentration used for the previous year to account for natural weathering of fuel residuals). At this rate, the BTEX injection rate is reduced by 80 percent after approximately 10 years, and by 90 percent after approximately 15 years. The rate of BTEX decrease was increased from the 10-percent rate used in the MacDill AFB Site 56 model (Parsons ES, 1995b) due to the lack of pavement overlying the contaminated soils at Pumphouse 75. The lack of pavement should enhance the decrease in shallow soil BTEX concentrations due to volatilization, aerobic biodegradation, and precipitation-induced leaching. These BTEX reduction rates are slightly lower than calculated BTEX reduction rates for a site at Eglin AFB, Florida that also is characterized by shallow contamination and sandy soils. At the Eglin site, where a fuel spill occurred in 1986, soil sampling performed in 1993 indicated a substantial reduction in BTEX concentrations within 7 years. Using the computed reduction rates, it was determined that nearly 100 percent of the BTEX in the vadose zone soils should disappear within approximately 10 years (Parsons ES, 1995c).

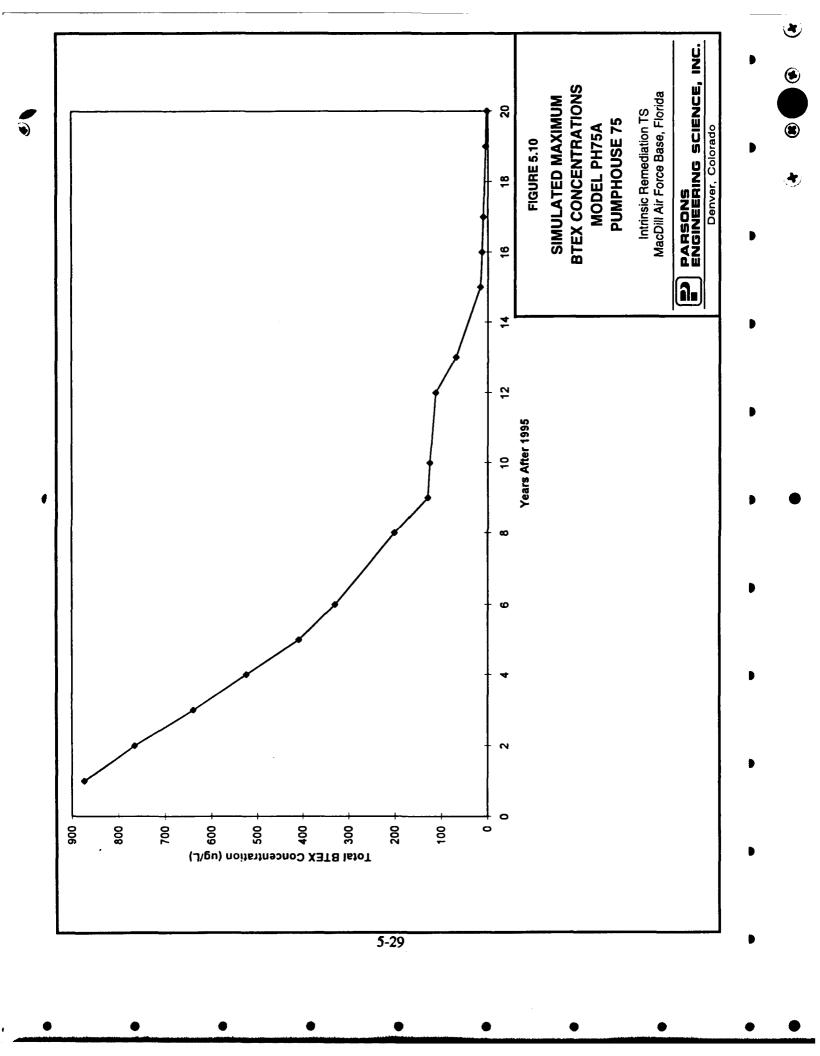
The second simulation (PH75B) assumes that all of the contaminated soils in the model cells containing simulated injection wells are actively remediated via bioventing for 3 years, at the end of which the source area is no longer contributing BTEX to the groundwater. In this scenario, there is a 45-percent reduction in contaminant concentrations during both years 1 and 2, with the remaining 10 percent disappearing by the end of year 3. The third simulation (PH75C) is similar to simulation PH75B, but assumes a more limited bioventing system that remediates only the soils in seven model grid cells (in the vicinity of and between monitoring wells MD75-MW14 and MD75-MW08). The rates of decrease in injected BTEX concentrations for the biovented grid cells in this simulation are identical to those described above for simulation PH75B. Complete input and output files are presented in Appendix D. Model results are described in the following sections. Model ime for the predictive simulations is described using the term "simulation time", which refers to model time after the initial 0.33-year calibration period (i.e., simulation time after March 1995).

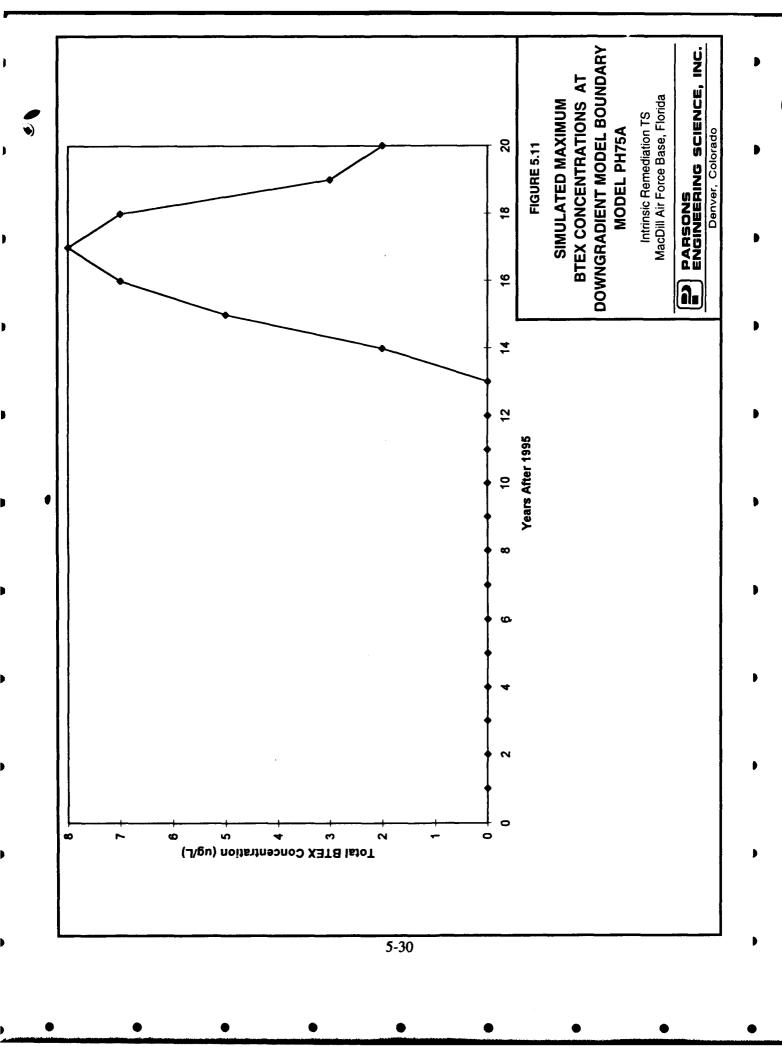
5.6.1 Diminishing BTEX Source (Model PH75A)

To predict the fate and transport of dissolved BTEX compounds at Pumphouse 75, model PH75A was run for a period of 20 years. The concentrations of BTEX introduced into the shallow aquifer at the 16 injection well locations shown on Figure 5.3 were decreased at a rate of 15 percent per year, as described above. The temporal variations in the maximum dissolved BTEX concentrations in the plume and at the downgradient model boundary (model grid row 29) are shown in Figures 5.10 and 5.11, respectively. As shown in Figure 5.10, the maximum simulated dissolved BTEX concentration in the plume peaks at 874 μ g/L following the first simulation year (early 1996), then decreases steadily until it is below 50 μ g/L by the end of simulation year 14, and equals 3 μ g/L at the end of year 20. Figure 5.11 shows that the leading edge of the BTEX plume reaches the downgradient model boundary [actually, the farthest downgradient row of active model cells (model grid row 29)] in simulation year 14, with the BTEX concentrations peaking at 8 μ g/L in year 17 and decreasing to 2 μ g/L in year 20.

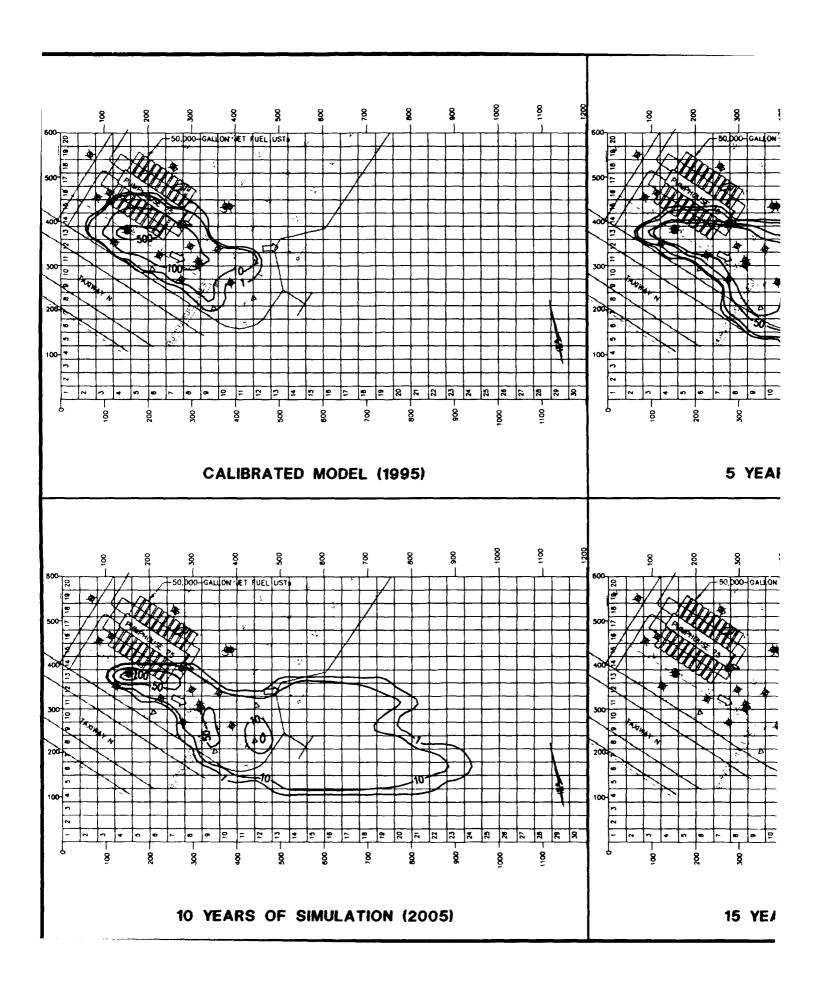
Plume isopleth maps for simulation years 5, 10, and 15 are shown in Figure 5.12. The lobate shape of the downgradient edge of the plume after 5 years may be caused by the unequal distribution of BTEX injection concentrations in model grid row 9, and by the presence of a low-transmissivity zone in the model surrounded by relatively high-transmissivity zones. Groundwater (and dissolved contaminants) would preferentially migrate toward and

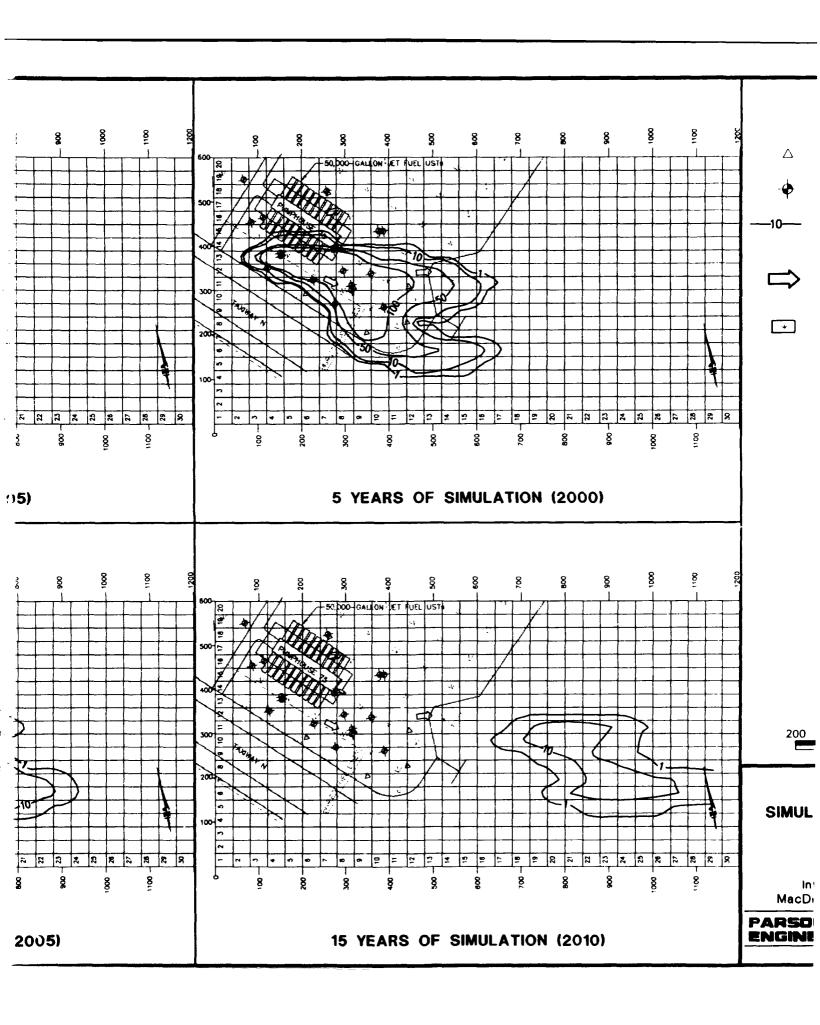
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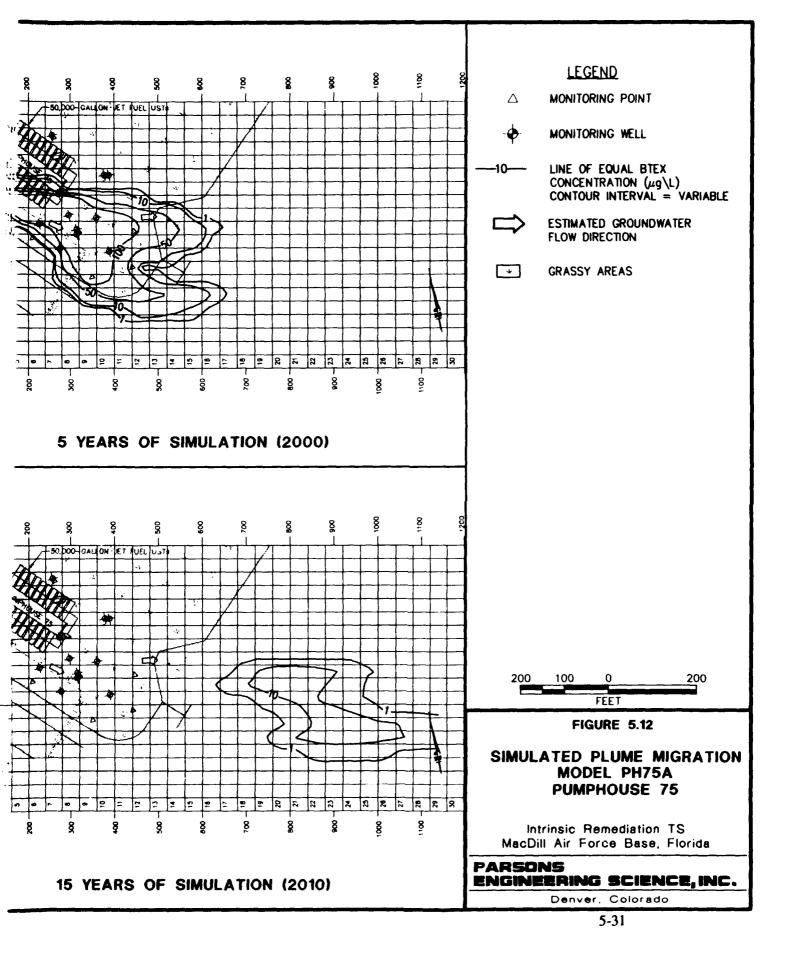




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through high-transmissivity zones. As shown on Figure 5.12, the BTEX plume separates from the source area by year 15 due to decreases in source area BTEX injection rates, and is wholly contained in the downgradient portion of the model grid. From years 15 to 20, the plume continues to migrate toward the downgradient model boundary and decreases in both magnitude (concentration) and areal extent. A discussion of mass balance errors obtained during this simulation is contained in Appendix D.

As described in Section 5.4.2.1, model PH75A was rerun using retardation coefficients of 1.0 and 1.15 rather than 1.3 to assess the degree to which small variations in this parameter significantly affected model predictions. Using a value of 1.0 caused the maximum dissolved BTEX concentration in the plume to decrease below 50 μ g/L by simulation year 13, and the plume disappeared completely after simulation year 15. The maximum BTEX concentration in model grid row 29 was 3 μ g/L. Using a retardation of 1.15 caused the maximum BTEX concentration to decrease below 50 μ g/L by simulation year 14. The maximum concentration in model grid row 29 was 18 μ g/L after simulation year 16, decreasing to 7 μ g/L after 20 years. These simulations indicate that small variations in the retardation coefficient do not significantly affect model predictions. In all cases, low BTEX concentrations migrated to the model grid boundary, and the temporal changes in the magnitudes of BTEX concentrations within the plume were similar.

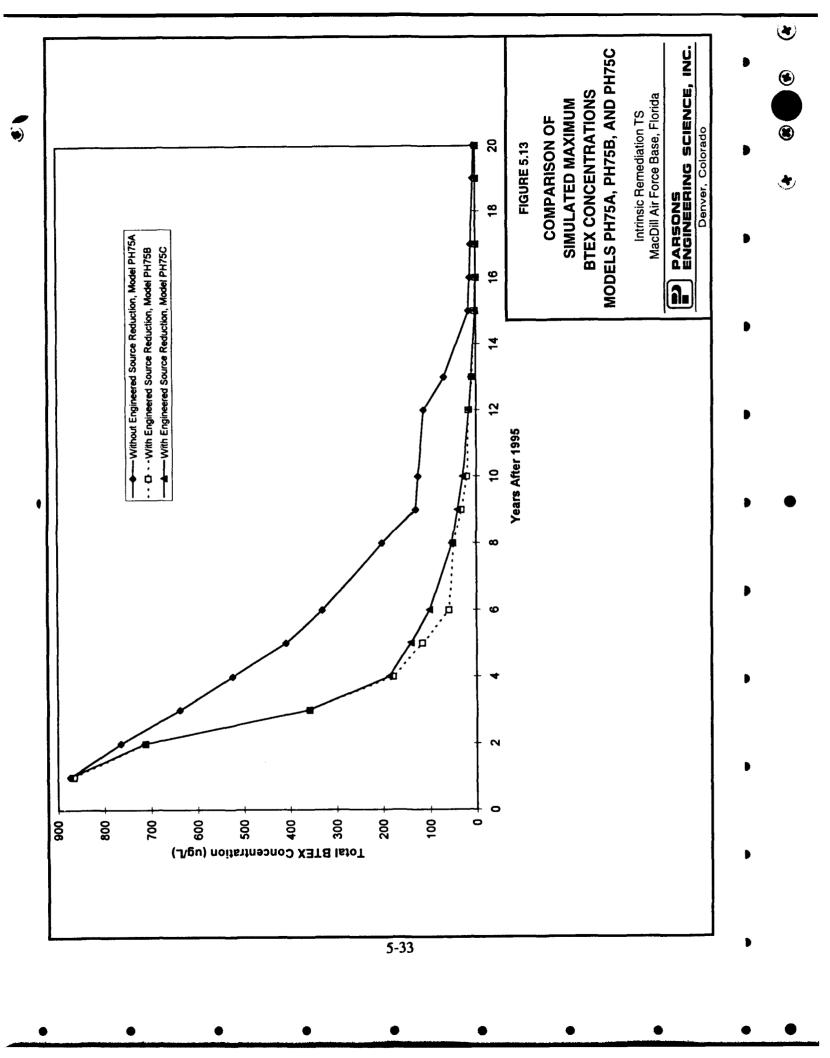
5.6.2 Engineered Source Reduction (Models PH75B and PH75C)

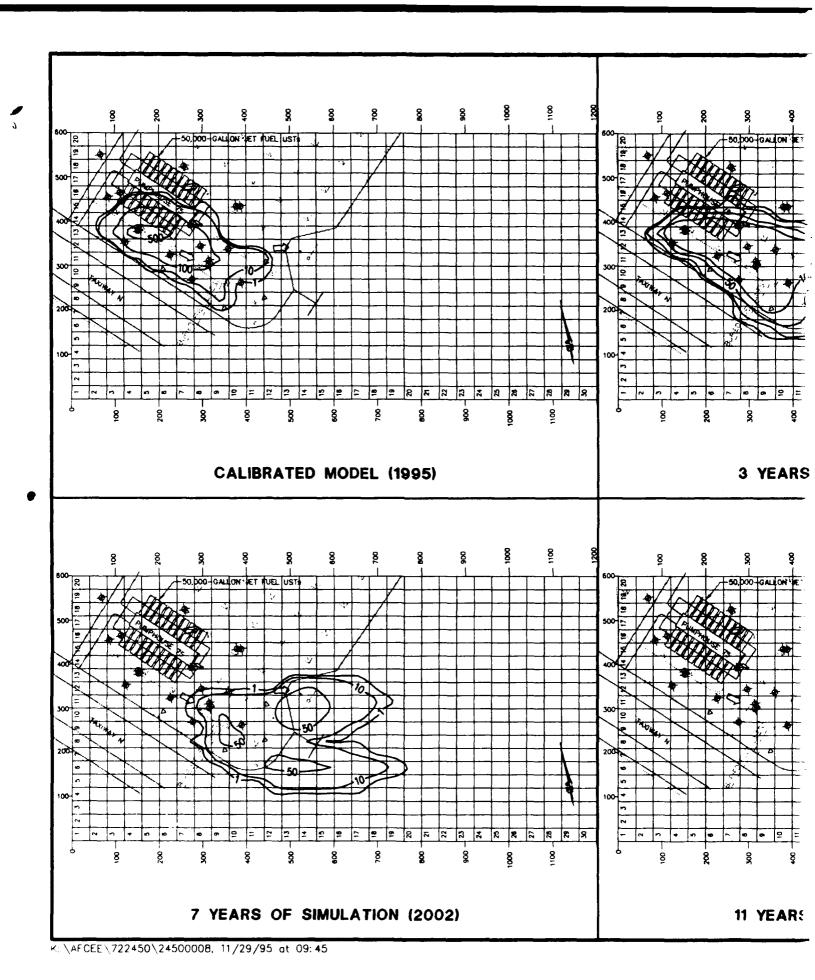
To illustrate the impact of engineered source reduction activities upon dissolved BTEX migration, models PH75B and PH75C incorporated more rapidly decreasing BTEX loading rates, assuming that bioventing or a similar in situ method would be used to remediate the source areas. Bioventing is an in situ process in which low-flow air injection is used to enhance the aerobic biodegradation of organic contaminants in subsurface soils by supplying oxygen to indigenous microbes. Both of the models referenced above assumed complete remediation of vadose zone soils in the source area after 3 years. Bioventing pilot tests at the Patrick AFB, Florida BX Service Station resulted in a BTEX removal rate of over 95 percent during the first year of testing (Parsons ES, 1995d). In model PH75B, remediation of all BTEX-contaminated vadose zone soils in the vicinity of the fuel pipelines is assumed. This is modeled through source term reductions at all 16 simulated BTEX injection wells. In model PH75C, only the soils within model grid cells (13,4), (14,4), (12,5), (13,5), (11,6), (12,6),and (11,7) were remediated within a 3-year period; BTEX loading resulting from the remaining nine injection wells decayed at a rate of 15 percent per year, as in model PH75A.

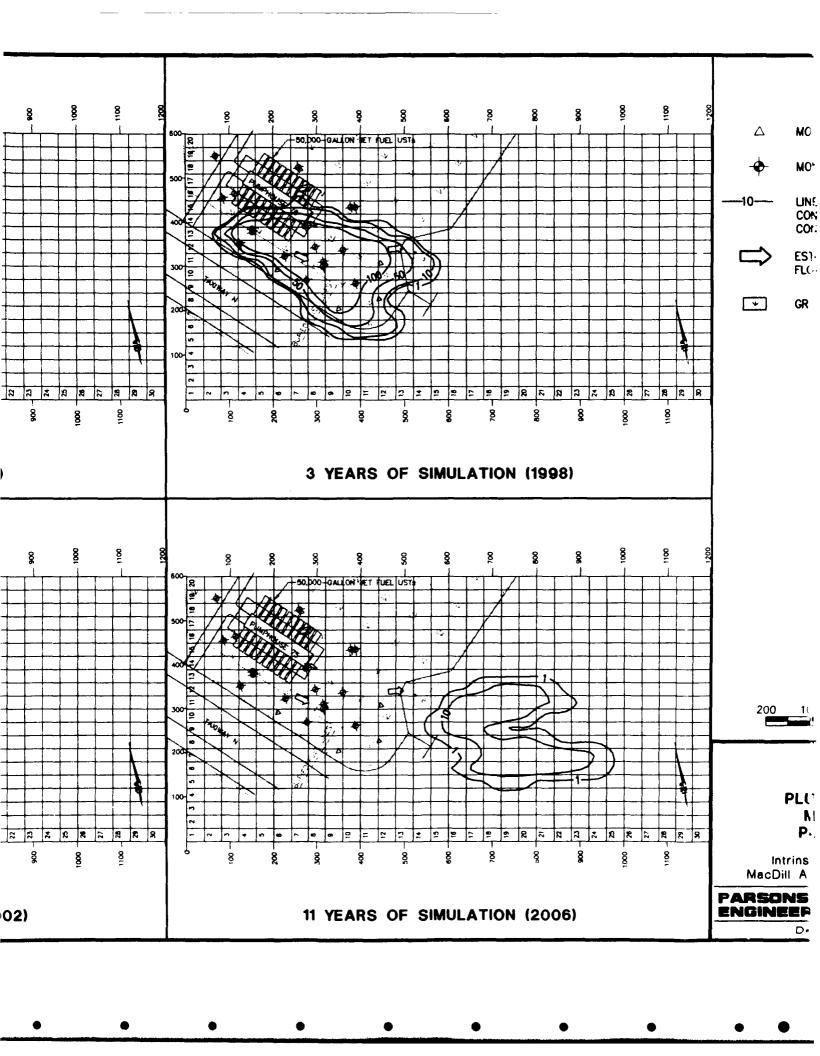
Model PH75B was run for a period of 16 years. As shown on Figure 5.13, this model predicts that the maximum dissolved BTEX concentrations in the plume would decrease dramatically following remediation of source area soils, declining to below 50 μ g/L after 7 years. The plume reaches its furthest downgradient extent (approximately 450 feet downgradient of the estimated March 1995 plume front) during simulation years 11 and 12, and never migrates beyond model grid row 24. After 15 years of simulation time, the BTEX plume is completely biodegraded. The simulated configurations of the dissolved BTEX plume after 3, 7, and 11 years are shown on Figure 5.14.

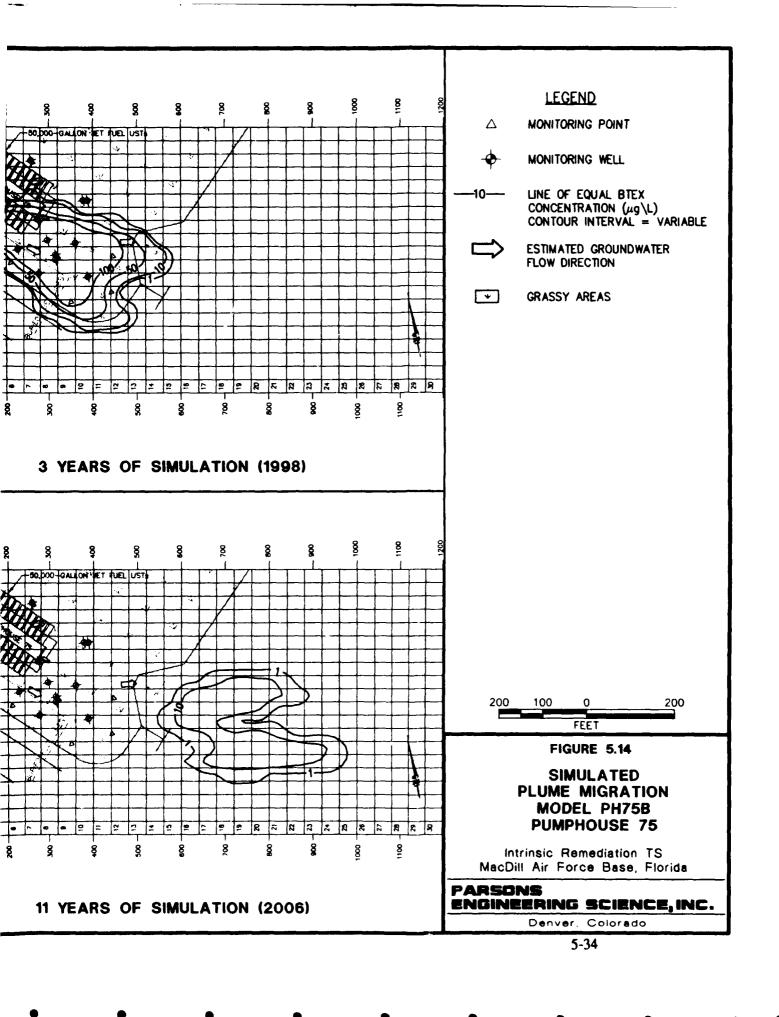
Model PH75C was also run for a period of 16 years. As shown on Figure 5.13, the results of this model are very similar to those of model PH75B, suggesting that if bioventing is performed, it should be focused in the vicinity of model cells (14,4), (13,4), (12,5), (12,6), (11,6), and (11,7), because this is where the most significant soil contamination

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appears to be located. This model predicts that the maximum dissolved BTEX concentration in the plume will decrease below 50 μ g/L after simulation year 8, and the plume is completely biodegraded after 15 years of simulation time. A dissolved BTEX concentration of 2 μ g/L reaches the most downgradient row of active model cells (model grid row 29) during year 15 before the plume disappears completely.

5.7 Conclusions and Discussion

Three model simulations were run to simulate a variety of conditions. Model PH75A assumed natural attenuation of BTEX in source area soils. Models PH75B and PH75C were identical to PH75A except that they simulated the effects of rapid remediation of source area soils through bioventing or another *in situ* method.

The results of the Bioplume II model simulations described in Section 5.6 suggest that the dissolved BTEX contamination will primarily remain in the modeled area and decrease in concentration to below 50 μ g/L after 14 years, even if no engineered remediation is performed. The modeling suggests that engineered remediation of source area soils would further restrict the downgradient migration of the dissolved BTEX plume, and promote a relatively rapid decrease in dissolved BTEX concentrations. If an engineered soil remediation technology is employed, consideration should be given to limiting its use to the area near and between monitoring wells 75MD-MW04 and 75MD-MW08.

The removal of dissolved BTEX compounds predicted by the simulations is largely a function of anaerobic biodegradation and sorption. Influxes of fresh groundwater enhance biodegradation by flushing water containing electron acceptors through the BTEX plume, which is retarded with respect to the advective groundwater velocity. As a result, biodegradation processes are maintained due to the continuous influx of electron acceptors. This is further enhanced by the additional influxes of electron acceptors in the grassy areas where precipitation recharge of the groundwater system occurs.

In all cases, model simulations are conservative for several reasons, including:

- 1) Aerobic respiration, denitrification, iron reduction, sulfate reduction, and methanogenesis are all occurring at this site; however, only DO is considered as an electron acceptor during model simulations, and the anaerobic decay coefficient used in the calibrated model is lower than common literature values and values computed for similar sites both at MacDill AFB and Patrick AFB, Florida.
- 2) The stoichiometry used to determine the ratio between DO and total BTEX assumed that no microbial cell mass is produced during the reaction. As discussed in Section 4.3.2.1, this approach may be too conservative by a factor of up to three.
- 3) A low coefficient of retardation which is most representative of benzene (1.3) was used for model simulations. The use of the low coefficient of retardation tends to increase the distance traveled by the simulated BTEX plume, but may provide a more accurate estimate of benzene transport.

In summary, the strong geochemical evidence of anaerobic biodegradation, and the reasonably conservative nature of the Bioplume II models, suggest that natural attenuation will substantially reduce dissolved BTEX concentrations and limit plume migration. It is important

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to note that the modeled scenarios incorporate the assumption that the contaminant source is not continuous, but that any leaks have been remedied. The simulated injection wells are intended to represent continuing partitioning of BTEX from measured concentrations of residual LNAPL into the groundwater. Bioplume II assumes that the migration of BTEX compounds is predominantly in the horizontal direction. Further investigation of the vertical migration of BTEX compounds at this site should be performed. Recommendations for additional investigations of this nature are described in Section 8.

SECTION 6

COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES

This section presents the development and comparative analysis of two groundwater remedial alternatives for Pumphouse 75 at MacDill AFB. The intent of this evaluation is to determine if intrinsic remediation is an appropriate and cost-effective remedial approach to consider when developing final remedial strategies for the site, especially when combined with other innovative and conventional remedial technologies.

Section 6.1 presents the evaluation criteria used to evaluate groundwater remedial alternatives. Section 6.2 discusses the development of remedial alternatives considered as part of this demonstration project. Section 6.3 provides a brief description of each of these remedial alternatives. Section 6.4 provides a more detailed analysis of the remedial alternatives using the defined remedial alternative evaluation criteria. The results of this evaluation process are summarized in Section 6.5.

6.1 REMEDIAL ALTERNATIVE EVALUATION CRITERIA

The evaluation criteria used to identify appropriate remedial alternatives for shallow groundwater contamination at the site were adapted from those recommended by the USEPA (1988) for selecting remedies for Superfund sites [Office of Solid Waste and Emergency Response (OSWER) Directive 9355.3-01]. These criteria included (1) long-term effectiveness and permanence, (2) technical and administrative implementability, and (3) relative cost. The following sections briefly describe the scope and purpose of each evaluation criterion. This report focuses on the potential use of intrinsic remediation and source reduction technologies to reduce BTEX concentrations within the shallow groundwater to levels that meet regulatory standards intended to be protective of human health and the environment.

6.1.1 Long-Term Effectiveness and Permanence

Each remedial approach or remedial alternative (which can be a combination of remedial approaches such as intrinsic remediation and institutional controls) was analyzed to determine how effectively it will minimize groundwater plume expansion so that applicable groundwater quality standards can be achieved at a downgradient POC. The expected remedial effectiveness based on case histories from other sites with similar conditions also is evaluated. The ability to minimize potential impacts to surrounding facilities and operations is considered. Also, the ability of each remedial alternative to protect both current and potential future receptors from potential exposures associated with site-related contamination in shallow groundwater is qualitatively assessed by conservatively evaluating the potential for completion of

exposure pathways involving groundwater, either now or in the future. This evaluation criterion also included permanence and the ability to reduce contaminant mass, toxicity, and volume. Time to implementation and estimated time until protection is achieved are described. Long-term reliability for providing continued protection, including an assessment of potential for failure of the technology and the potential threats resulting from such a failure, also is evaluated.

6.1.2 Implementability

The technical implementation of each remedial technology/approach or remedial alternative was evaluated in terms of technical feasibility and availability. Potential logistical shortcomings and difficulties in construction, operations, and monitoring are presented and weighed against perceived benefits. Requirements for any post-implementation site controls such as LTM and land or groundwater use restrictions are described. Details on administrative feasibility in terms of the likelihood of public acceptance and the ability to obtain necessary approvals are discussed.

6.1.3 Cost

The total cost (present worth) of each remedial alternative was estimated for relative comparison following USEPA (1993) guidance. An estimate of capital costs, and operations and post-implementation costs for site monitoring and controls is included. An annual discount factor of 7 percent was assumed in present worth calculations (USEPA, 1993).

6.2 FACTORS INFLUENCING ALTERNATIVES DEVELOPMENT

Several factors were considered during the identification and screening of remedial technologies for addressing shallow groundwater contamination at the site. Factors considered included the objectives of the natural attenuation demonstration program; contaminant, groundwater, and soil properties; present and future land uses; and potential receptor exposure pathways. The following section briefly describes each of these factors and how they were used to narrow the list of potentially applicable remedial technologies to the final remedial alternatives considered for the site.

6.2.1 Program Objectives

The intent of the intrinsic remediation demonstration program sponsored by AFCEE is to develop a systematic process for scientifically investigating and documenting naturally occurring subsurface attenuation processes that can be factored into overall site remediation plans. The objective of this program and the specific Pumphouse 75 study is to provide solid evidence of intrinsic remediation of dissolved fuel hydrocarbons so that this information can be used to develop an effective groundwater remediation strategy. A secondary goal of this multi-site initiative is to provide a series of regional case studies that demonstrate that natural processes of contaminant degradation can often reduce contaminant concentrations in groundwater to below acceptable cleanup standards before completion of potential exposure pathways.

Because the objective of this program is to study natural processes in the saturated zone rather than all contaminated media (soil, soil gas, etc.), approaches and technologies have been evaluated based primarily on their potential impact on shallow groundwater and phreatic soils. Technologies that can reduce vadose zone contamination and partitioning of contaminants into groundwater have also been evaluated. Many of the source removal technologies evaluated in this section will also reduce soil and soil gas contamination, but it is important to emphasize that the remedial alternatives developed in this document are not necessarily intended to remediate all contaminated media.

Additional program objectives set forth by AFCEE include cost effectiveness and minimization of waste. Approaches and technologies that may meet these criteria include institutional controls, soil vapor extraction, bioventing, biosparging, groundwater pump and treat, and intrinsic remediation. Soil excavation, slurry walls, sheet piling, carbon adsorption, ex situ biological or chemical treatment, and onsite/offsite disposal are generally not attractive technology candidates under this program.

6.2.2 Contaminant Properties

The site-related contaminants considered as part of this demonstration at Pumphouse 75 are the BTEX compounds. The source of this contamination is AVGAS, JP-4, and/or JP-8 present as residual contamination in capillary fringe and saturated soil in the vicinity of Pumphouse 75. The physiochemical characteristics of these fuels and the individual BTEX compounds will greatly influence the effectiveness and selection of a remedial technology.

Petroleum hydrocarbon mixtures, such as AVGAS, JP-4, and JP-8, are comprised of over 300 compounds with different physiochemical characteristics. These fuels are classified as a LNAPLs with liquid densities ranging from 0.73 to 0.80 gram per cubic centimeter (g/cc) at 20°C (Arthur D. Little, Inc., 1987). Many compounds in these fuels sorb very well to soil and are concentrated in the capillary fringe because the mixtures are less dense than water. AVGAS, JP-4, and JP-8 are slightly soluble in water, with maximum solubilities ranging from 5 to 300 mg/L. These fuels are also a primary substrate for biological metabolism. Simultaneous biodegradation of aliphatic, aromatic, and alicyclic hydrocarbons has been observed. In fact, mineralization rates of hydrocarbons in mixtures such as JP-4 may be faster than mineralization of the individual constituents as a result of cometabolic pathways (Jamison et al., 1975; Perry, 1984).

The BTEX compounds are generally volatile, highly soluble in water, and adsorb less strongly to soil than other hydrocarbons in a petroleum mixture. These characteristics allow the BTEX compounds to leach more rapidly from mobile LNAPL and contaminated soil into groundwater, and to migrate as dissolved contamination (Lyman et al., 1992). All of the BTEX compounds are highly amenable to in situ degradation by both biotic and abiotic mechanisms.

Benzene is very volatile, with a vapor pressure of 76 millimeters of mercury (mm Hg) at 20°C and a Henry's Law Constant of approximately 0.0054 atmosphere-cubic

meters per mole (atm-m³/mol) at 25°C (Hine and Mookerjee, 1975; Jury et al., 1984). The solubility of pure benzene in water at 20°C has been reported to be 1,780 mg/L (Verschueren, 1983). Benzene is normally biodegraded to carbon dioxide, with catechol as a short-lived intermediate (Hopper, 1978; Ribbons and Eaton, 1992).

Toluene is also volatile, with a vapor pressure of 22 mm Hg at 20°C and a Henry's Law Constant of about 0.0067 atm-m³/mol at 25°C (Pankow and Rosen, 1988; Hine and Mookerjee, 1975). Toluene sorbs more readily to soil media relative to benzene, but still is very mobile. The solubility of pure toluene in water at 20°C is approximately 515 mg/L at 20°C (Verschueren, 1983). Toluene has been shown to degrade to pyruvate, acetaldehyde, and completely to carbon dioxide via the intermediate catechol (Hopper, 1978; Wilson et al., 1986; Ribbons and Eaton, 1992).

Ethylbenzene has a vapor pressure of 7 mm Hg at 20°C and a Henry's Law Constant of 0.0066 atm-m³/mol (Pankow and Rosen, 1988; Valsaraj, 1988). Ethylbenzene tends to sorb more strongly to soils than benzene but less strongly than toluene (Abdul et al., 1987). Pure ethylbenzene is also less soluble than benzene and toluene in water at 152 mg/L at 20°C (Verschueren, 1983; Miller et al., 1985). Ethylbenzene ultimately degrades to carbon dioxide via its intermediate 3-ethylcatechol (Hopper, 1978; Ribbons and Eaton, 1992).

The three isomers of xylene have vapor pressures ranging from 7 to 9 mm Hg at 20°C and Henry's Law Constants of between 0.005 and 0.007 atm-m³/mol at 25°C (Mackay and Wolkoff, 1973; Hine and Mookerjee, 1975; Pankow and Rosen, 1988). Of all of the BTEX compounds, xylenes sorb most strongly to soil, but still can leach from soil into the groundwater (Abdul et al., 1987). Pure xylenes have water solubilities of 152 to 160 mg/L at 20°C (Bohon and Claussen, 1951; Mackay and Shiu, 1981; Isnard and Lambert, 1988). Xylenes can degrade to carbon dioxide via pyruvate carbonyl intermediates (Hopper, 1978; Ribbons and Eaton, 1992).

On the basis of these physiochemical characteristics, intrinsic remediation, soil vapor extraction, bioventing, biosparging/air sparging, groundwater extraction, and air stripping technologies could all be effective options for collecting, destroying, and/or treating BTEX contaminants at Pumphouse 75.

6.2.3 Site-Specific Conditions

Two general categories of site-specific characteristics were considered when identifying remedial technologies for comparative evaluation as part of this demonstration project. The first category was physical characteristics such as groundwater depth, gradient, flow direction, and soil type, which influence the types of remedial technologies most appropriate for the site. The second category involved assumptions about future land uses and potential exposure pathways. Each of these site-specific characteristics have influenced the selection of remedial alternatives included in the comparative evaluation.

6.2.3.1 Groundwater and Soil Characteristics

Site geology and hydrogeology will have a profound effect on the transport of contaminants and the effectiveness and scope of required remedial technologies at a given site. Hydraulic conductivity is perhaps the most important aquifer parameter governing groundwater flow and contaminant transport in the subsurface. The velocity of the groundwater and dissolved contamination is directly related to the hydraulic conductivity of the saturated zone. Slug tests conducted in the vicinity of the Pumphouse 75 site indicate a moderate conductivity within the sand unit present in the vicinity of the source area and dissolved plume. Estimated conductivity values ranged from 5.2 to 90.7 ft/day, characteristic of sand or silty sand. The hydraulic conductivity at this site directly influences the fate and transport of contaminants. The shallow groundwater migrates to the east-southeast, increasing the extent of contamination (i.e., the plume has expanded) but decreasing the average BTEX concentration within the aquifer through dilution and biodegradation.

Although higher hydraulic conductivities can result in plume expansion and migration, this same characteristic also will enhance the effectiveness of other remedial technologies, such as groundwater extraction, biosparging, and intrinsic remediation. For example, it should be less expensive and time-consuming to capture and treat the contaminant plume using a network of extraction wells in areas of high hydraulic conductivity. Contaminant recovery also may be maximized when contaminants are not significantly sorbed to and retarded by phreatic soil. The effectiveness of biosparging may also be increased in highly conductive aquifers because of reduced entry pressures and increased radius of influence. Greater hydraulic conductivity also would increase the amount of contaminant mass traveling through a biosparging network. The DO introduced through biosparging can enhance aerobic degradation of the dissolved contaminant mass, particularly at a site such as Pumphouse 75 where oxygen-deficient groundwater predominates.

The movement of contaminants within the subsurface away from the source also will increase the effectiveness of natural biodegradation processes by distributing the contaminant mass into areas enriched with electron acceptors. In addition, because BTEX compounds are retarded relative to the advective flow velocity, relatively fresh groundwater containing DO and other electron acceptors will migrate through the plume area, further increasing biodegradation.

To satisfy the requirements of indigenous microbial activity and intrinsic remediation, the aquifer must also provide an adequate and available carbon or energy source, electron acceptors, essential nutrients, and proper ranges of pH, temperature, and redox potential. Data collected as part of the field work phase of this demonstration project and described in Sections 3 and 4 of this document indicate that this site is characterized by adequate and available carbon/energy sources and electron acceptors to support measurable biodegradation of fuel hydrocarbon contamination by indigenous microorganisms. Sulfate and carbon dioxide (which is utilized during methanogenesis) represent primary sources of electron acceptor capacity for the biodegradation of BTEX compounds at the site. Relatively minor electron acceptors include DO and ferric iron. Further, because fuel-hydrocarbon-degrading microorganisms have been known to thrive under a wide range of temperature and pH

conditions (Freeze and Cherry, 1979), the physical and chemical conditions of the groundwater and phreatic soil at the site are not likely to inhibit microorganism growth.

Fuel-hydrocarbon-degrading microorganisms are ubiquitous, and as many as 28 hydrocarbon-degrading isolates (bacteria and fungi) have been identified in different soil environments (Davies and Westlake, 1977; Jones and Eddington, 1968). Indigenous microorganisms have a distinct advantage over microorganisms injected into the subsurface to enhance biodegradation because indigenous microorganisms are well adapted to the physical and chemical conditions of the subsurface in which they reside (Goldstein et al., 1985). Therefore, microbe addition was not considered a viable remedial technology for this site.

6.2.3.2 Potential Exposure Pathways

A pathways analysis identifies the human and ecological receptors that could potentially come into contact with site-related contamination and the pathways through which these receptors might be exposed. To have a completed exposure pathway, there must be a source of contamination, a potential mechanism(s) of release, a pathway of transport to an exposure point, an exposure point, and a receptor. If any of these elements do not exist, the exposure pathway is considered incomplete, and receptors will not come into contact with site-related contamination. Evaluation of the potential long-term effectiveness of any remedial technology or remedial alternative as part of this demonstration project includes determining if the approach will be sufficient and adequate to minimize plume expansion so that potential receptor exposure pathways involving shallow groundwater contaminants are incomplete.

Assumptions about current and future land uses at a site form the basis for identifying potential receptors, potential exposure pathways, reasonable exposure scenarios, and appropriate remediation goals. USEPA (1991) advises that the land use associated with the highest (most conservative) potential level of exposure and risk that can reasonably be expected to occur should be used to guide the identification of potential exposure pathways and to determine the level to which the site must be remediated. The current land use at the site is industrial. The primary source area appears to be the fuel supply pipelines located immediately southwest of the pumphouse. Additional, relatively minor, sources may include the fuel USTs and related pipelines beneath and adjacent to the pumphouse.

Pumphouse 75 is surrounded by flight aprons, taxiways, fueling stations (fuel pits), other pumphouses, and intervening relatively undeveloped areas for at least 800 feet in all directions. In the hydraulically downgradient directions (southeast, east, and northeast), these features extend for at least 1,500 feet before the nearest more developed areas are encountered. These more developed areas, which border Hangar Loop Drive, primarily contain flight hangars, maintenance buildings, and office buildings. Therefore, the current land use within and downgradient of the contaminant plume is entirely commercial/industrial. The head of a northwest/southeast-trending drainage ditch is located approximately 1,100 feet southeast of the Pumphouse 75. This ditch does not appear to be directly hydraulically downgradient of the pumphouse based on the available data, but general local groundwater flow direction information suggests that groundwater contamination from the pumphouse could migrate toward the

ditch. Water in the ditch flows approximately 2.4 miles via a series of ditches into Tampa Bay. The shallow drainage swale located immediately east of the pumphouse trends to the north-northeast, and may discharge into a northeast-trending drainage ditch located approximately 2,400 feet northeast of the pumphouse. This drainage ditch is approximately 3,000 feet long and flows into Hillsborough Bay. The shallow drainage swale adjacent to the pumphouse contains water only during precipitation events, and could potentially receive groundwater discharge only during extremely wet periods when the groundwater table is very near the ground surface.

Under reasonable current land use assumptions, potential receptors include only Base worker populations, because the Bioplume II model results indicate that the dissolved BTEX plume will not migrate far enough to pose a threat to potential receptors exposed at the nearest downgradient drainage ditch, and will not migrate off Base. Workers could be exposed to site-related contamination in phreatic soils or shallow groundwater if these materials are removed or exposed during future construction excavations or remedial activities. Groundwater from the shallow aquifer is not currently used to meet any demands at MacDill AFB. All Base potable water is supplied by the city of Tampa. There are no private wells located on the Base, and the Hillsborough County designated Wellhead Protection Area nearest to Site 57 is located approximately 13 miles north of the Base (BVWS, 1995). The nearest private well, reportedly located at least 0.6 mile north of Pumphouse 75, is used for irrigation (BVWS, 1995). Exposure pathways involving other environmental media such as vadose zone soils and soil gas in the source area were not considered as part of this project, but should be considered in overall site remediation decisions.

Assumptions about hypothetical future land uses also must be made to ensure that the remedial technology or alternative considered for shallow groundwater at the site is adequate and sufficient to provide long-term protection. The future use of Pumphouse 75 and the surrounding area is projected to be unchanged from the current uses described above. Therefore, potential future receptors are the same as those listed in the preceding paragraph. The potential future exposure pathways involving Base workers are identical to those under current conditions provided shallow groundwater is not used to meet industrial water demands. In summary, the use of the intrinsic remediation technology at this site will require that the source area be maintained as industrial property and that restrictions on shallow groundwater use be enforced in areas downgradient from the site until natural attenuation reduces contaminants to concentrations that meet regulatory standards. If source removal technologies such as soil vapor extraction, bioventing, biosparging, or groundwater pump and treat are implemented, they will have some impact on the short- and long-term land use options and will require some level of institutional control and worker protection during remediation.

6.2.3.3 Remediation Goals for Shallow Groundwater

The results of model PH75A suggest that BTEX compounds are not likely to move more than 150 feet downgradient from the downgradient model boundary (or approximately 850 feet downgradient from the estimated March 1995 plume front. Therefore, an area approximately 900 feet beyond the current leading edge of the BTEX plume has been identified as the POC for groundwater remedial activities

because this is the projected maximum extent of future contaminant migration. This is a suitable location for monitoring and for demonstrating compliance with protective groundwater quality standards.

This remedial strategy assumes that compliance with promulgated, single-point remediation goals is not necessary if site-related contamination does not pose a threat to human health or the environment (i.e., exposure pathways are incomplete). Thus, the magnitude of required remediation in areas that can and will be placed under institutional control is different from the remediation that is required in areas that may be available for unrestricted use. The primary remedial action objective (RAO) for shallow groundwater at and downgradient of Pumphouse 75 is limited plume expansion to prevent exposure of downgradient receptors to concentrations of BTEX in groundwater at levels that exceed regulatory standards or guidelines. This means that viable remedial alternatives must be able to achieve concentrations that minimize plume migration and/or expansion. The ultimate RAO for shallow groundwater at the POC is attainment of state no-further-action guidelines for G-II groundwater in an area where there are no drinking water wells within 0.25 mile of the site, and no public water supply wells within 0.50 mile of the site. These guidelines are contained in No Further Action and Monitoring Only Guidelines for Petroleum Contaminated Sites [Florida Department of Environmental Regulation (DER), 1990)], and are summarized in Table An interim RAO for attainment of "monitoring only" status for shallow groundwater are the "monitoring only" guidelines presented in Florida DER (1990). These interim guidelines could be used to determine when to discontinue an aggressive remedial action such as source removal via bioventing or a groundwater pump-and-treat system and allow intrinsic remediation with monitoring to remediate to no-furtheraction levels.

In summary, available data suggest that there is no completed potential exposure pathway involving shallow groundwater under current conditions. Moreover, it is likely that no additional potential exposure pathways involving shallow groundwater would be completed under future land use assumptions, provided use of shallow groundwater as a potable or industrial source of water is prohibited by institutional controls within the plume area and within an area approximately 1,500 feet downgradient from the March 1995 downgradient plume boundary. Thus, institutional controls are likely to be a necessary component of any groundwater remediation strategy for this site. The required duration of these institutional controls may vary depending on the effectiveness of the selected remedial technology at reducing contaminant mass and concentration in the groundwater.

6.2.4 Summary of Remedial Technology Screening

Several remedial technologies were identified and screened for use in treating the shallow groundwater at the site. Table 6.2 identifies the initial remedial technologies considered as part of this demonstration and those retained for detailed comparative analysis. Screening was conducted systematically by considering the program objectives of the AFCEE intrinsic remediation demonstration, physiochemical properties of the BTEX compounds, and other site-specific characteristics such as hydrogeology, land use assumptions, potential exposure pathways, and appropriate remediation goals. All of these factors will influence the technical effectiveness,

TABLE 6.1 POINT-OF-COMPLIANCE REMEDIATION GOALS FOR GROUNDWATER PUMPHOUSE 75

INTRINSIC REMEDIATION TS MACDILL AIR FORCE BASE, FLORIDA

Compound	Groundwater RAO ^{a/} (μg/L) ^{b/}	Groundwater RAO (µg/L)
	(no further action)	(monitoring only)
Benzene	50	50 (perimeter)
		500 (source area)
Total BTEX ^{c/}	50	50 (perimeter)
		1,000 (source area)

a/ RAO = remedial action objective.

b/ $\mu g/L = micrograms per liter.$

c/ BTEX = benzene, toluene, ethylbenzene, and xylenes.

Source: Florida DER, 1990

TECHNOLOGIES AND PROCESS OPTIONS FOR GROUNDWATER REMEDIATION INITIAL TECHNICAL IMPLEMENTABILITY SCREENING OF **PUMPHOUSE 75** TABLE 6.2

INTRINSIC REMEDIATION TS MACDILL AIR FORCE BASE, FLORIDA

Response Action	3			
	Type	Process Option	Implementability	Retain
Long-Term	Periodic	Confirmation	Many existing wells are available to confirm the progress of remediation.	Yes
Monitoring	Groundwater	Wells		
	Monitoring	Point-of-	Sufficient distance exists between the plume and point-of-compliance to	Yes
		Compliance Wells	locate several wells.	
Institutional	Groundwater Use	Land Use	Plume area is currently within the Base boundary, and land and	Yes
Controls	Control	Control/Regulate	groundwater use are under Base jurisdiction.	
		Well Permits		
		Seal/Abandon	No production wells are known to exist in the existing or predicted plume	N _o
_		Existing Wells	area.	
		Point-of-Use	No shallow groundwater is extracted from the plume area for any use.	No No
		Treatment		
	Public Education	Meetings/	Base public relations and environmental management offices have many	Yes
		Newsletters	information avenues to workers and residents.	
Containment of	Hydraulic Controls	Passive Drain	Hydraulic conductivity of site soils favors pumping. Passive collection	No
Plume		Collection	could feasibly be implemented, but relatively low dissolved BTEX	
			concentrations indicate that this more aggressive remedial option is not	
			necessary.	
		Minimum	Hydraulic conductivities of site soils are moderate to high and would allow	No
		Pumping/Gradient	extraction of sufficient volumes. Treatment of extracted water would	
		Control	probably be necessary. Relatively low dissolved BTEX concentrations	
			indicate that this more aggressive remedial option is not necessary.	
	Physical Controls	Slurry	Requires significant disruption of site. Limited effectiveness.	ž
		Walls/Grout		
		Curtains		
		Sheet Piling	Requires significant disruption of site. Limited effectiveness.	No
<u> </u>	Reactive/Semi-	Biologically	Natural biodegradation of BTEX compounds can be stimulated by allowing	No No
	Permeable Barriers	Active Zones	contaminated groundwater to flow through an aquifer zone which has	•
			enhanced oxygen and nutrient conditions. A new, unproven technology.	

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TECHNOLOGIES AND PROCESS OPTIONS FOR GROUNDWATER REMEDIATION INITIAL TECHNICAL IMPLEMENTABILITY SCREENING OF INTRINSIC REMEDIATION TS MACDILL AIR FORCE BASE, FLORIDA TABLE 6.2 (Continued) **PUMPHOUSE 75**

General	Technology			
Response Action	Туре	Process Option	Implementability	Retain
In Situ Treatment	Biological	Oxygen and/or	Differs from biologically active zone in that oxygen and/or nutrients are	Yes
		Nutrient Enhanced	injected in or downgradient of plume to limit plume migration by enhancing	
		Biodegradation	biodegradation and reducing BTEX concentrations as the plume moves	
		(Biosparging)	downgradient from the source area. Limited radius of influence and short-	
			circuiting are common problems.	
	Chemical/Physical	Intrinsic	A combination of natural biological, chemical, and physical removal	Yes
		Remediation	mechanisms which occur to varying degrees on every site. Groundwater	
			sampling at Pumphouse 75 indicates that this is a major, ongoing remediation	
			process.	
		Air Sparging	Injection of air into contaminated aquifer creating a mass transfer of BTEX	Yes
		(Volatilization)	into air bubbles and into vadose zone. Limited radius of influence and short-	
			circuiting are common problems.	
Aboveground	Groundwater	Vertical Pumping	Groundwater plume "hot spot" is pumped by installing wells with submersible	Š
Groundwater	Extraction	Wells	pumps. Option is implementable, and would constitute an aggressive remedial	
Treatment			option, but relatively low dissolved BTEX concentrations indicate that less	
			aggressive and expensive options would be adequate to remediate the	
			groundwater.	
		Downgradient	See Passive Drain Collection.	°Z
		Horizontal Drains		
	Biological	Bioreactors	High flow rates require excessive retention times and large reactors. BTEX is	Š
			often volatilized in these systems.	
	Chemical/Physical	Air Stripping	Cost-effective technology for removing varying concentrations of BTEX at	νς
			higher flow rates. Groundwater extraction not retained as a remedial option.	
		Activated Carbon	Cost prohibitive for more concentrated BTEX or long system operation times.	No
			Creates a carbon disposal problem. Carbon is also used to treat off-gas from air	
			strippers. Groundwater extraction not retained as a remedial option.	
		UV/Ozone	High flow rates require excessive retention times and large, expensive reactors.	No
		Reactors	Groundwater extraction not retained as a remedial option	

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TECHNOLOGIES AND PROCESS OPTIONS FOR GROUNDWATER REMEDIATION TABLE 6.2 (Continued) INITIAL TECHNICAL IMPLEMENTABILITY SCREENING OF INTRINSIC REMEDIATION TS MACDILL AIR FORCE BASE, FLORIDA **PUMPHOUSE 75**

General	Technology			
Response Action	Type	Process Option	Implementability	Retain
Aboveground	Direct Discharge		Viable option when an IWWTP is readily available and capable of handling	%
Treatment	to Industrial Waste		BTEX and hydraulic loading. IWWTP not readily available. Groundwater	
	Water Treatment		extraction not retained as a remedial option.	
	Flant (IWW I.P.)			
Treated Ground	Discharge to	IWWTP	Viable option when an IWITP is readily available and capable of handling	2
Water Disposal	IWWTP or		BTEX. IWWTP not readily available. Groundwater extraction not retained	
	Sanitary Sewe.		as a remedial option.	
		Sanitary Sewer	Viable option when access to sanitary sewer exists and hydraulic loading is	°Z
			acceptable. Groundwater extraction not retained as a remedial option.	
	Treated	Vertical Injection	Not recommended due to clogging and high maintenance. Groundwater	%
	Groundwater	Wells	extraction not retained as a remedial option.	
	Reinjection		•	
		Injection Trenches	Require large trenches and can be subject to injection well permitting.	No
			Groundwater extraction not retained as a remedial option.	
	Discharge to	Storm Drains	Viable option but generally requires NPDES or other discharge permit.	ટ્ટ
	Surface Waters		Groundwater extraction not retained as a remedial option.	
Source	Excavation/	Biological	Excavation may be feasible at this site, but source removal could also be	ž
Removal/Soil	Treatment	Landfarming	accomplished using less intrusive methods.	
Remediation				
		Thermal	Offsite thermal treatment potentially implementable. Soil excavation not	ž
		Desorption	retained as a remedial option.	
	In Situ	Bioventing	Air injection to stimulate biodegradation of fuel residuals. Soils in source	Yes
			areas should not limit effectiveness.	
		Soil Vapor	Vapor extraction has been successfully implemented at other sites. Requires	Yes
		Extraction	source definition and off-gas treatment. Bioventing is preferred, but vapor	
			extraction may be necessary before bioventing can be implemented.	
		Soil Amendments	The primary limiting factor in natural biodegradation is lack of oxygen.	°Z
			Supplementing other electron acceptor concentrations through the use of soil	
			amendments would not significantly increase biodegradation rates to the	
			extent that oxygen addition would.	

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implementation, and relative cost of technologies for remediating shallow groundwater underlying and migrating from the site. The remedial approaches and source removal technologies retained for development of remedial alternatives and comparative analysis include institutional controls, intrinsic remediation combined with LTM, and bioventing/biosparging/soil vapor extraction.

6.3 BRIEF DESCRIPTION OF REMEDIAL ALTERNATIVES

This section describes how remedial technologies retained from the screening process were combined into two remedial alternatives for Pumphouse 75. Sufficient information on each remedial alternative is provided to facilitate a comparative analysis of effectiveness, implementability, and cost in Section 6.4.

6.3.1 Alternative 1-Intrinsic Remediation and Institutional Controls with Long-Term Groundwater Monitoring

Intrinsic remediation is achieved when naturally occurring attenuation mechanisms bring about a reduction in the total mass of a contaminant in the soil or dissolved in groundwater. Intrinsic remediation results from the integration of several subsurface attenuation mechanisms that are classified as either destructive or nondestructive. Destructive attenuation mechanisms include biodegradation, abiotic oxidation, and hydrolysis. Nondestructive attenuation mechanisms include sorption, dilution (caused by dispersion and infiltration) and volatilization. In some cases, intrinsic remediation will reduce dissolved contaminant concentrations below numerical concentration goals intended to be protective of human health and the environment. As indicated by the evidence of intrinsic remediation described in Section 4, these processes are occurring in the vicinity of Pumphouse 75 and will continue to reduce contaminant mass in the plume area.

Results of the Bioplume II model PH75A suggest that the dissolved BTEX concentrations will decrease below 50 μ g/L during simulation year 14 (2009), and that the plume will reach a maximum downgradient extent after approximately 17 years of simulation time. During simulation year 17, the model predicts that the dissolved BTEX concentration at the downgradient model boundary will peak at 8 μ g/L, which is well below the groundwater RAOs, even if the entire estimated BTEX concentration is assumed to consist of benzene (Table 6.1). In subsequent years, the model predicts that intrinsic remediation within the BTEX plume and along the plume margins will prevent further plume migration, assuming BTEX loading in the source area decreases at a rate of 15 percent per year, as described in Section 5.6. The model suggests that the plume will not migrate further than approximately 150 feet beyond the downgradient model boundary, as described in Section 5.6.

Implementation of Alternative 1 would require the use of institutional controls such as land use restrictions and LTM. Land use restrictions may include placing long-term restrictions on soil excavation in the source area and long-term restrictions on groundwater well installations within and downgradient of the plume area. The intent of these restrictions would be to reduce potential receptor exposure to contaminants by legally restricting activities within areas affected by site-related contamination.

At a minimum, groundwater monitoring within the plume area would be conducted annually as part of the implementation of this remedial alternative to evaluate the progress of natural attenuation processes. Based on the potential plume migration suggested by the modeling, it is unlikely that benzene concentrations exceeding the most stringent Florida standard of 1 μ g/L [Florida Department of Environmental Protection (DEP), 1994] would be present more than approximately 850 feet downgradient from the 1995 plume front (approximately 150 feet downgradient from the model boundary). This would be true even if it were assumed that simulated contaminant concentrations consist entirely of benzene rather than a mixture of the BTEX compounds. It is unlikely that benzene and dissolved BTEX concentrations exceeding the no-further-action guideline of 50 μ g/L (Table 6.1) would be present more than approximately 550 feet downgradient from the 1995 plume front. The recommended components of LTM, including well locations, are described in Section 7.2.

Public education on the selected alternative would be developed to inform Base personnel and residents of the scientific principles underlying source reduction and intrinsic remediation. This education could be accomplished through public meetings, presentations, press releases, and posting of signs where appropriate. Periodic site reviews also could be conducted using data collected during the LTM program. The purpose of these reviews would be to evaluate the extent of contamination, assess contaminant migration and attenuation through time, document the effectiveness of source removal and/or institutional controls at the site, and reevaluate the need for additional remedial actions at the site.

6.3.2 Alternative 2-Bioventing/Biosparging in Source Area, Intrinsic Remediation, and Institutional Controls with Long-Term Groundwater Monitoring

This alternative is identical to Alternative 1 except that bioventing would be used to enhance the biodegradation of organic contaminants in subsurface soils by supplying oxygen to indigenous microbes using low-flow air injection in the vicinity of Pumphouse 75. Bioventing is preferred over soil vapor extraction because bioventing uses a low rate of air injection that significantly reduces emissions into the atmosphere while maximizing in situ biodegradation. However, bioventing using standard air injection techniques could create uncontrolled migration of potentially combustible vapors within the vadose zone. Therefore, bioventing should be preceded by approximately 1 to 2 months of soil vapor extraction (SVE) to reduce VOC concentrations in the soil vapor.

On the basis of Parsons ES experience in the application of bioventing technology, one horizontal air injection well installed in a shallow trench within the area of contaminated vadose zone soils should be sufficient to remediate the most significantly contaminated vadose zone soils in the vicinity of the fuel pipelines. The length of the well would be approximately 180 feet. Approximately four shallow vapor monitoring points also would be installed to allow measurement of the effectiveness of the injection well. Parsons ES has installed a similar bioventing system at the BX Service Station at Patrick AFB, Florida, where subsurface conditions are similar to those encountered at Pumphouse 75.

A bioventing system should remove at least 95 percent of residual soil BTEX compounds within 1 to 3 years. Operation of the bioventing system during a relatively dry year, when water levels are low, may be required to substantially decrease residual BTEX concentrations in the capillary fringe. The effect of this relatively rapid source removal on the migration of the groundwater BTEX plume was evaluated using the Bioplume II model, as described in Section 5.6.2. The simulation PH75B assumes that such a decrease in soil concentrations will produce a similar decrease in BTEX dissolution into the groundwater. The results of this models suggest that remediation of source area soils would further restrict the downgradient migration of the dissolved benzene plume, and promote a relatively rapid decrease in dissolved BTEX concentrations. After approximately 7 years, the maximum dissolved BTEX concentrations would drop below 50 μ g/L. The results of simulation PH75C, which assumes remediation of a smaller volume of soil nearest the estimated primary contamination source area, suggest that this more limited remediation would be a cost-effective means of accomplishing source removal objectives.

An alternative design option would be to inject air below the groundwater surface and allow the air (oxygen) to move upward through the capillary fringe and into the contaminated vadose zone. This process, known as air sparging or biosparging, also would increase the DO content of the groundwater and promote more rapid degradation of dissolved BTEX compounds in the plume. Installation of the horizontal air injection well within 1 foot of the average groundwater surface would allow it to function as a sparging well during periods of relatively high water levels when the well would be submerged, and as a bioventing well during periods of 'atively normal and low water levels. This configuration would promote biodegradatic f residual BTEX both above and below the groundwater surface, seasonally increase the DO content of the groundwater, and be compatible with system operation in an SVE mode.

As with Alternative 1, institutional controls and LTM would be required. POC and LTM wells would be installed in the locations indicated in Section 7.2. At a minimum, groundwater monitoring would be conducted annually as part of this remedial alternative to evaluate the progress of source removal and natural attenuation processes.

6.4 EVALUATION OF ALTERNATIVES

This section provides a comparative analysis of each of the remedial alternatives based on the effectiveness, implementability, and cost criteria. A summary of this evaluation is presented in Section 6.5.

6.4.1 Alternative 1—Intrinsic Remediation and Institutional Controls with Long-Term Groundwater Monitoring.

6.4.1.1 Effectiveness

Section 5 of this document presents the results of the Bioplume II modeling completed to support the intrinsic remediation alternative at Pumphouse 75. Model PH75A results predict that natural attenuation mechanisms will significantly limit contaminant migration and reduce contaminant mass and toxicity. The Bioplume II model is based upon reasonably conservative assumptions, as described in Section 5.7.

Groundwater monitoring at the LTM and POC wells will ensure the protectiveness of this alternative. While this alternative would not cease to be protective if the BTEX plume is intercepted at the POC wells, such an instance would indicate that site conditions should be reevaluated.

The effectiveness of this remedial alternative requires that excavations or drilling within the source area be conducted only by properly protected site workers. Reasonable land use assumptions for the plume area indicate that exposure is unlikely unless excavation or drilling activities bring saturated soil to the surface. Long-term land use restrictions would be required to ensure that shallow groundwater will not be pumped or removed for potable use in the vicinity of the plume (within approximately 1,000 feet in the upgradient and crossgradient directions and 1,500 feet in the downgradient direction). Existing health and safety plans should be enforced to reduce risks from additional excavation or from installing and monitoring additional POC wells.

Compliance with program goals is one component of the long-term effectiveness evaluation criterion. Alternative 1 would satisfy program objectives designed to promote intrinsic remediation as a component of site remediation and to scientifically document naturally occurring processes. This alternative also satisfies program goals for cost effectiveness and waste minimization.

Alternative 1 is based on the effectiveness of naturally occurring processes that minimize contaminant migration and reduce contaminant mass over time, and the effectiveness of institutional controls. As described earlier, an investigation of the potential effectiveness of naturally occurring processes at Pumphouse 75 using field data and the Bioplume II model demonstrated that the BTEX plume migration will be significantly limited and the extent eventually reduced.

Apart from the administrative concerns associated with enforcement of long-term land use restrictions and long-term groundwater and surface water monitoring programs, this remedial alternative should provide reliable, continued protection. It is assumed for cost comparison purposes that dissolved benzene concentrations would exceed state guidelines throughout the plume for approximately 14 years under Alternative 1, and that sampling would be performed annually. An additional 4 years of annual sampling is recommended to demonstrate that intrinsic remediation has uniformly reduced BTEX concentrations to below applicable guidelines.

6.4.1.2 Implementability

Alternative 1 is not technically difficult to implement. Installation of LTM and POC wells and periodic groundwater sampling and analysis are standard procedures. Long-term management efforts would be required to ensure that proper sampling procedures are followed. Periodic site reviews should be conducted to confirm the adequacy and completeness of LTM data and to verify the effectiveness of this remediation approach. There also may be administrative concerns associated with long-term enforcement of groundwater use restrictions. Future land use within the source area may be impacted by leaving contaminated soil and groundwater in place. Regulators and the public will

have to be informed of the benefits and limitations of the intrinsic remediation option, but educational programs are not difficult to implement.

6.4.1.3 Cost

The cost of Alternative 1 is summarized in Table 6.3. Capital costs are limited to the construction of four new POC wells and three new LTM wells. Two LTM wells would be screened at the bottom of the surficial aquifer, assumed to be present at a depth of 25 feet. Included in the \$263,000 total present worth cost estimate for Alternative 1 are the costs of maintaining institutional controls and long-term groundwater monitoring for a total of 18 years. Cost calculations are contained in Appendix E.

6.4.2 Alternative 2 - Bioventing/Biosparging in Source Area, Intrinsic Remediation, and Institutional Controls with Long-Term Groundwater Monitoring

6.4.2.1 Effectiveness

The effectiveness of the intrinsic remediation, institutional controls, and LTM components of this alternative have been described under Alternative 1. Bioventing is an established technology that effectively remediates fuel hydrocarbons in the unsaturated zone via the addition of oxygen to stimulate biodegradation by naturallyoccurring microorganisms. The application of bioventing for 1 year at the Patrick AFB, Florida BX gasoline station resulted in a 95-percent reduction in the total BTEX in soil residuals impacting groundwater (Parsons ES, 1995d). Given the Bioplume II Models PH75B and PH75C results discussed in Section 5.6, reduction in the mass of BTEX compounds that dissolve into groundwater should further limit plume migration and ultimately reduce the extent of the dissolved BTEX plume. If a combination bioventing/biosparging system is installed, as described in Section 6.3.2, the resulting increase in the DO content of the groundwater should further enhance the attenuation of the BTEX plume. As with Alternative 1, this alternative would require long-term land use restrictions, as well as enforcement of health and safety plans to reduce risks to workers during installation of the bioventing/biosparging system and installation and monitoring of LTM and POC wells.

Alternative 2 should provide reliable, continuous protection with little risk from temporary system failures. This alternative also complies with the program goals because intrinsic remediation remains the predominant remedial method for fuel hydrocarbons dissolved in groundwater at the site. However, this remedial alternative may result in the generation of potentially contaminated soil requiring treatment and/or disposal, unless the Base is allowed to use these soils as backfill material in the excavated vent well trenches.

It is assumed that dissolved benzene and total BTEX concentrations will exceed applicable state guidelines for no further action (Table 6.1) throughout the plume for approximately 8 years under Alternative 2. An additional 4 years of annual groundwater monitoring is recommended to ensure that intrinsic remediation has uniformly reduced all BTEX compounds to levels below state guidelines.

TABLE 6.3 ALTERNATIVE 1 - COST ESTIMATE PUMPHOUSE 75 INTRINSIC REMEDIATION TS MACDILL AIR FORCE BASE, FLORIDA

Capital Costs	Cost
Design/Construct Four POC Wells and Five LTM Wells	\$17,435
Operation, Maintenance, and Monitoring Costs (Annual)	Annual Cost
Conduct Annual Groundwater Monitoring of 11 wells (years 1-4)	\$8,323
Conduct Annual Groundwater Monitoring of 15 wells (years 5-18)	\$9,905
Maintain Institutional Controls/Public Education (18 years)	\$5,000
Project Management and Reporting (18 years)	\$10,175
Present Worth of Alternative 1 a	\$263,157

^{a/} Based on an annual discount factor of 7 percent (USEPA, 1993).

Note: Costs assume that well installation and LTM are performed by Tampa-area personnel.

6.4.2.2 Implementability

Installing and operating a bioventing/biosparging system to reduce source area BTEX concentrations at Pumphouse 75 could present additional implementability concerns. Installation would involve shallow trench excavation for well installation, piping, and manifold connections; therefore, implementation in and around the pumphouse could be disruptive to fueling operations. However, onsite facility operational activity appears to be minimal, and disruption of regular site activities would probably be relatively insignificant. Bioventing equipment is readily available, and the technology used to construct such systems is proven and reliable. Use of an internal combustion engine to extract and combust vapors during SVE is assumed; therefore, air emissions permitting activities should be minimal. The technical and administrative implementability concerns associated with the intrinsic remediation and LTM component of this remedial alternative are similar to those discussed in Alternative 1. Installation and operation of a full-scale bioventing/biosparging system would require an increased commitment of man-hours and other resources to maintain and monitor the system. Public acceptance of this alternative may be more positive than Alternative 1 because source removal actions would be implemented.

6.4.2.3 Cost

The estimated capital and operating costs of Alternative 2 are shown in Table 6.4. The total present worth cost of Alternative 2 is approximately \$317,000. The cost of Alternative 2 is greater than Alternative 1 because of the addition of the bioventing/biosparging system, even though the length of LTM is reduced from 18 to 12 years. It is assumed that the bioventing/biosparging system would be operated for 3 years after installation. Annual LTM would continue for a total of 12 years to ensure that intrinsic remediation is reducing BTEX concentrations below state G-II requirements (Table 6.1) throughout the plume, and to verify that contamination above these requirements does not reach the POC wells.

6.5 RECOMMENDED REMEDIAL APPROACH

Two remedial alternatives have been evaluated for remediation of the shallow groundwater at Pumphouse 75. Components of the alternatives evaluated include SVE, bioventing/biosparging, intrinsic remediation with LTM, and institutional controls. Table 6.5 summarizes the results of the evaluation based upon effectiveness, implementability, and cost criteria.

Alternative 1 makes maximum use of intrinsic remediation mechanisms to reduce plume migration and toxicity. Alternative 2 would provide additional protection against further plume migration by reducing the magnitude of continuing sources while still relying on intrinsic remediation mechanisms to reduce plume mass and toxicity in

TABLE 6.4 ALTERNATIVE 2 - COST ESTIMATE PUMPHOUSE 75 INTRINSIC REMEDIATION TS MACDILL AIR FORCE BASE, FLORIDA

Capital Costs	Cost
Design/Construct Four POC Wells and Five LTM Wells	\$17,435
Design/Construct SVE/Bioventing/Biosparging System, Including Manifolding and Blowers (assuming one horizontal well 180 feet long plus 100 feet to the Pumphouse)	\$65,000
Operation, Maintenance and Monitoring Costs (Annual)	Annual Cost
Operate and Maintain SVE/Bioventing/Biosparging System (3 years)	\$15,435
Conduct Annual Groundwater Monitoring of 11 wells (years 1-4)	\$8,323
Conduct Annual Groundwater Monitoring of 15 wells (years 5-12)	\$9,905
Maintain Institutional Controls/Public Education (12 years)	\$5,000
Project Management and Reporting (12 years)	\$10,175
Present Worth of Alternative 2 a	\$316,647

^{a/} Based on an annual discount factor of 7 percent (USEPA, 1993). Note: Costs assume that LTM and bioventing system maintenance are performed by Tampa-area personnel.

SUMMARY OF REMEDIAL ALTERNATIVES EVALUATION GROUNDWATER REMEDIATION INSTRINSIC REMEDIATION TS MACDILL AIR FORCE BASE, FLORIDA PUMPHOUSE 75 TABLE 6.5

Semedial Alternative	Effectiveness	Implementability	Present Worth Cost Estimate
Alternative 1			
- Intrinsic Remediation	Contaminant mass, volume, and toxicity will be	Contaminant mass, volume, and toxicity will be Readily implementable. Long-term management, groundwater \$263,157	263,157
- Long-Term Monitoring	significantly reduced and plume migration should be	significantly reduced and plume migration should be use controls, and monitoring required for an estimated 18 years.	
- Institutional Controls	halted. Groundwater quality guidelines for BTEX	halted. Groundwater quality guidelines for BTEX Minimal exposure of site workers if excavation is carefully	
	not likely to be exceeded at POC wells.	controlled in source area. If water quality guidelines are	
		exceeded at POC or in drainage ditch, additional remedial work	
		may be required.	
Alternative 2			
- Bioventing/Biosparging	Similar to Alternative 1, with the addition of a SVE	Similar to Alternative 1, with the addition of a SVE Readily implementable. Installation of a bioventing system \$316,647	316,647
- Soil Vapor Extraction	bioventing system (with or without biosparging) to	bioventing system (with or without biosparging) to should pose no problems. Bioventing estimated to continue for 3	
(SVE)	address residual LNAPL in soil. Contaminant mass,	address residual LNAPL in soil. Contaminant mass, years. Long-term site management, groundwater controls, and	
- Intrinsic Remediation	volume, and toxicity will be reduced more rapidly		
- Long-Term Monitoring	than in Alternative 1. Less likely that groundwater	standards are exceeded at POC wells, additional remedial work	
- Institutional Controls	quality guidelines will be exceeded at POC wells.	may be required.	

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the groundwater. Implementation of Alternative 2 would decrease the time frame for remediation, but would require a greater capital expenditure.

Both of the remedial alternatives are implementable, and each of them would effectively reduce potential hydrocarbon migration and toxicity. Both alternatives should be acceptable to the public and regulatory agencies because they are protective of human health and the environment and reduce soil and groundwater contamination to below cleanup guidelines. Implementation of either alternative will require land use and groundwater use controls to be enforced for at least 12 to 18 years, depending on the alternative selected and its effectiveness. Groundwater monitoring would be required for the same period.

On the basis of this evaluation, the Air Force recommends Alternative 1 as achieving the best combination of risk reduction and cost effectiveness. The final evaluation criterion used to compare each of the two remedial alternatives was cost. It is the opinion of the Air Force that the additional cost of Alternative 2 over Alternative 1 is not justified by the estimated 6-year decrease in remediation time resulting from the implementation of source removal activities. However, Alternative 2 (combination of bioventing and biosparging as described in Section 6.3.2) should be considered as a contingency in the event that land use in this area changes to commercial or residential, or if measured BTEX reductions in the groundwater are substantially slower than predicted by the Bioplume model. In addition, if a substantial length of the fuel pipelines is exposed in the near future to detect leakage and repair damage, then consideration should be given to installing a bioventing/biosparging system in the resulting excavation.

SECTION 7

LONG-TERM MONITORING PLAN

7.1 OVERVIEW

In keeping with the requirements of the preferred remedial alternative for Pumphouse 75 (intrinsic remediation with LTM), a long-term groundwater monitoring plan was developed. The purpose of this component of the preferred remedial alternative for the site is to assess site conditions over time, confirm the effectiveness of naturally occurring processes at reducing contaminant mass and minimizing contaminant migration, and evaluate the need for additional remediation.

The LTM plan consists of identifying the locations of two separate groundwater monitoring networks and developing a groundwater sampling and analysis strategy to demonstrate attainment of site-specific remediation goals (Table 6.1) and to verify the predictions of the Bioplume II model. The strategy described in this section is designed to monitor plume migration over time and to verify that intrinsic remediation is occurring at rates sufficient to protect potential receptors. In the event that data collected under this LTM program indicate that naturally occurring processes are insufficient to protect human health and the environment, contingency controls to augment the beneficial effects of intrinsic remediation would be necessary.

7.2 MONITORING NETWORKS

Two separate sets of wells will be utilized at the site as part of the intrinsic remediation with LTM remedial alternative. The first set will consist of 11 LTM wells at six locations within and upgradient and downgradient from the observed BTEX plume to verify the results of the Bioplume II modeling effort and to ensure that natural attenuation is occurring at rates sufficient to minimize plume expansion (i.e., meet the G-II level of remediation concentration goals for the site). This network of wells will include six existing wells screened within the shallow (four wells) and deep (two wells) portions of the surficial aquifer, and five proposed wells within and downgradient from the current BTEX plume to provide short-term confirmation and verification of the quantitative groundwater modeling results.

The second set of POC groundwater monitoring wells will be located along a line perpendicular to the direction of groundwater flow between 800 and 900 feet downgradient from the March 1995 plume front. The purpose of these POC wells is to verify that no BTEX compounds exceeding state groundwater quality guidelines migrate beyond the area under institutional control. Model results suggest that the plume front will not reach these POC locations. This network will consist of three to four shallow groundwater monitoring wells screened across the upper 8 feet of the

shallow aquifer. The LTM and POC well locations are shown on Figure 7.1. A total of six potential POC well locations are shown on this figure, because the groundwater flow direction southeast of Pumphouse 75 is not well established and may be seasonally variable. Once the five proposed LTM wells are installed, groundwater elevation measurements should be obtained from them and other Pumphouse 75 wells quarterly for a period of 1 year to establish the groundwater flow direction(s) downgradient of the pumphouse. This information should be used to select three to four optimum locations for POC well installation.

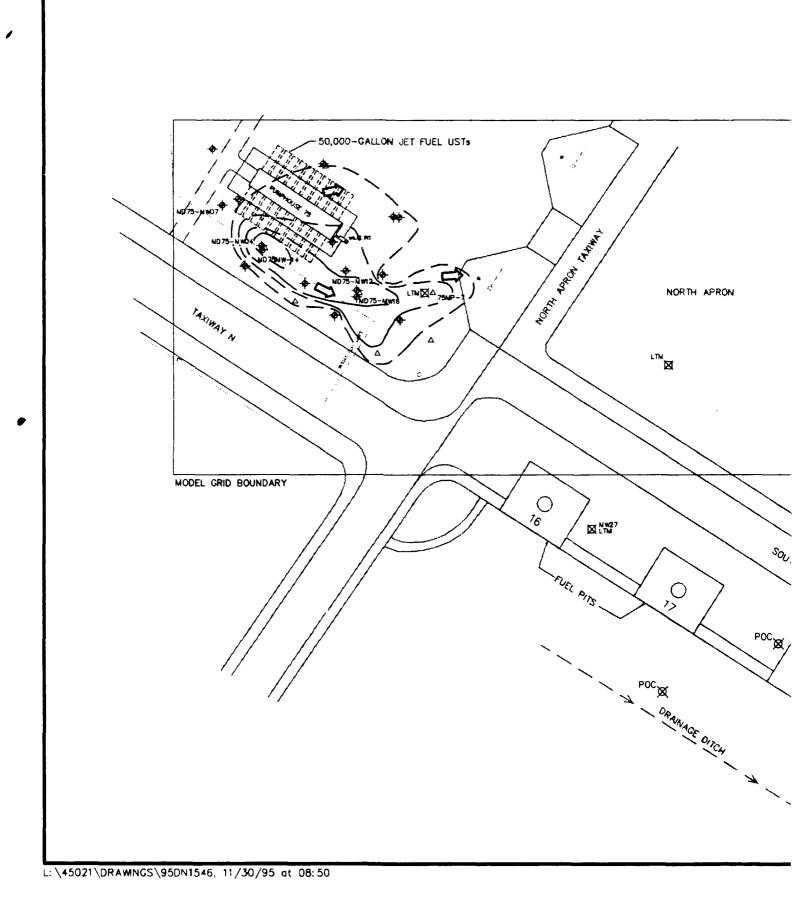
7.2.1 Long-Term Monitoring Wells

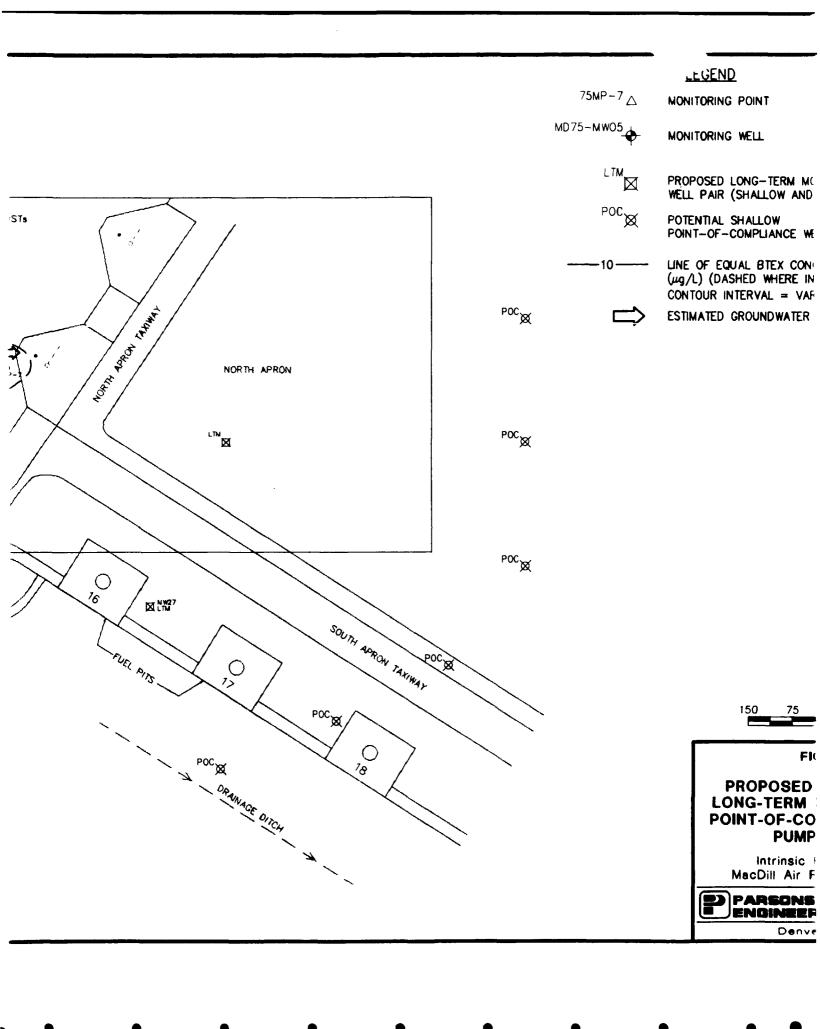
At six locations, a total of 11 groundwater monitoring wells within, upgradient from, and downgradient from the existing BTEX contaminant plume will be used to monitor the effectiveness of intrinsic remediation in reducing total contaminant mass and minimizing contaminant migration at Pumphouse 75. The LTM network will supplement the POC wells to provide early confirmation of model predictions and to allow additional response time if necessary.

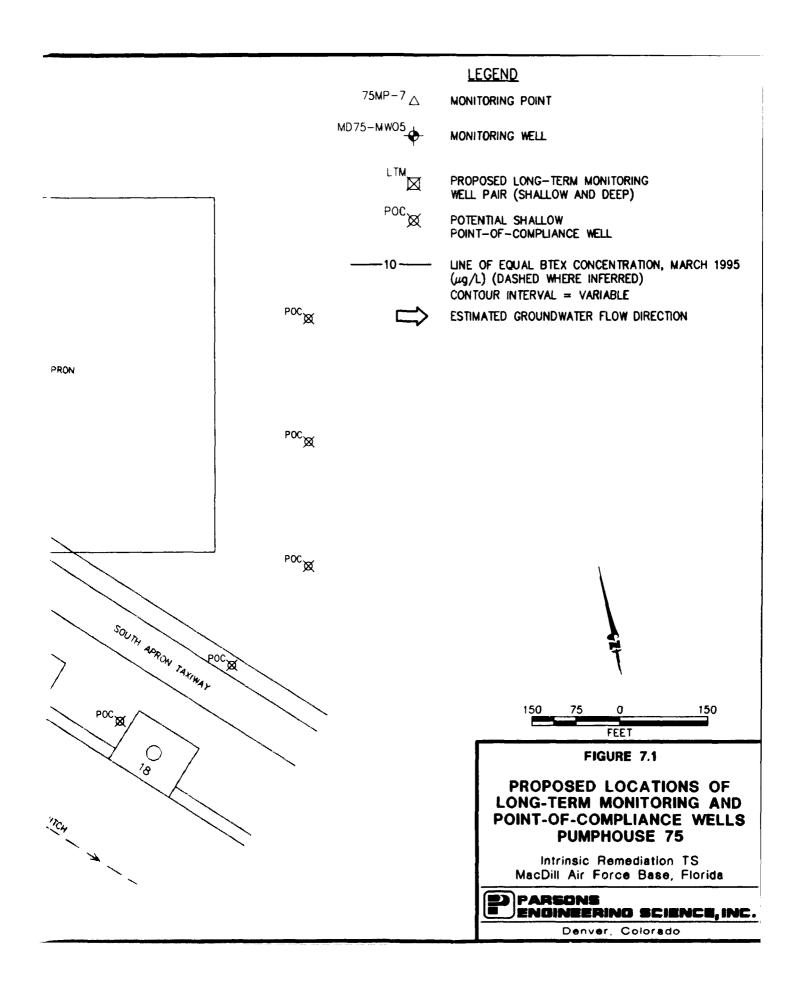
This LTM network will consist of wells screened both at the top and near the base of the surficial aquifer because of the indications that significant concentrations of dissolved BTEX may be migrating vertically as well as horizontally. However, the validity of the deeper BTEX detections should be verified before this LTM plan is fully implemented. Verification of the deeper detections is discussed in Section 8. If vertical migration of dissolved BTEX is found to be relatively insignificant, then the LTM wells should be screened primarily at the top of the surficial aquifer. Otherwise, both the upper and lower portions of the surficial aquifer should be monitored. The LTM plan presented in this section conservatively assumes that monitoring of both portions of the surficial aquifer will be required.

One existing well upgradient from the existing plume (MD75-MW07) will be monitored (Figure 7.1). Six of the remaining 10 LTM wells are located within the plume along its axis, including MD75-MW04 (shallow), MD75-MW14 (deep), MD75-MW12 (shallow), MD75-MW16 (deep), and adjacent to 75MP-7S/7D (shallow and deep). This LTM plan assumes that monitoring points 75MP-7S/7D will be replaced with conventionally constructed monitoring wells for LTM purposes. The shallow replacement for 75MP-7S should be screened across the top 8 feet of the surficial aquifer, with approximately 2 feet of screen above the water table. The deep replacement for 75MP-7D should be screened at a depth similar to the screens of existing wells MD75-MW14 and MD75-MW16 (approximately 20 to 25 feet bgs).

The remaining four LTM wells will be located downgradient from the current plume front along two potential migration pathways. One well pair, consisting of a shallow well screened across the top 8 feet of the surficial aquifer and a deep well screened across 5 feet at the base of the surficial aquifer (assumed for cost estimation purposes to be 25 feet bgs), will be located approximately 400 feet southeast of the current estimated plume front. This location was selected in the event that the plume migrates in the same direction as that observed at the pumphouse in March 1995. A second well pair located adjacent to Fuel Pit 16 also will be monitored. The shallow well of the pair will consist of existing well MW27, and the deep well will be screened at the base of the surficial aquifer. This location was selected in the event that the primary







groundwater flow direction southeast of the site is toward the northwest-southeast trending drainage ditch shown on Figure 7.1. Contouring of groundwater elevations measured during different seasons at both Pumphouse 75 and Fuel Pit 16 has indicated that groundwater flow directions may be seasonally variable, at times trending approximately parallel to the long axis of the model grid, and at times trending in a more southeasterly direction toward the drainage ditch (BVWS, 1995). Dissolved BTEX compounds historically have not been detected in groundwater samples from well MW27; therefore, interference from another source of contamination, such as the fuel pit, should not occur.

7.2.2 Point-of-Compliance Wells

A maximum of four POC monitoring wells should be installed approximately 800 to 900 feet downgradient from the existing BTEX plume. As was described above, six potential POC well locations are shown on Figure 7.1 because groundwater flow directions downgradient of the pumphouse have not been well established. Once the groundwater flow direction(s) have been established using data from the LTM wells, up to four POC well locations should be selected. The purpose of the POC wells is to verify that no contaminated groundwater exceeding state guidelines for G-II groundwater at petroleum-contaminated sites migrates beyond the area under institutional control. Model results suggest that the contaminant plume will not migrate beyond the POCs at concentrations exceeding applicable guidelines, and these POC wells are the technical mechanisms used to demonstrate protection of human health and the environment and compliance with site-specific numerical remediation goals. These wells will be installed and monitored to ensure that the selected remedy is providing the anticipated level of risk reduction and remediation at the site.

This LTM plan assumes that, at this distance from the pumphouse, any dissolved contamination will be located primarily in the upper portion of the surficial aquifer, and that the POC wells all will be screened in the uppermost 8 feet of this aquifer. If monitoring of LTM wells closer to the pumphouse indicates that significant concentrations of dissolved BTEX are migrating substantial distances from the site in the deeper portions of the surficial aquifer, then additional (deep) POC wells also should be installed and monitored.

7.3 GRCUNDWATER SAMPLING

To ensure that contaminant removal occurring at the Pumphouse 75 site is sufficient to protect human health and the environment and meet site-specific remediation goals, the long-term groundwater monitoring plan includes a comprehensive sampling and analysis plan (SAP). LTM and POC wells will be sampled and analyzed annually to verify that naturally occurring processes are effectively reducing contaminant mass and mobility. However, except for an initial sampling following their installation to confirm that these wells are not being impacted by another contamination source, annual sampling of the POC wells is recommended to begin in year 5 of the LTM program because of the large distance between these wells and the current plume front. The Bioplume II model, which used groundwater velocities that were slightly higher than those calculated using slug test data, predicted that contaminant concentrations would reach the downgradient model boundary during simulation year 14 (calendar year 2009). In the event that actual velocities are twice as high as simulated in the

model (which is unlikely), the plume would still take approximately 7 years (calendar year 2002) to reach this boundary. Therefore, beginning the POC well sampling in year 5 of the LTM program (calendar year 2000 if LTM is begun in 1996) should not compromise the monitoring scheme. Reductions in toxicity will be implied by mass reduction. The SAP also will be aimed at assuring intrinsic remediation can achieve site-specific remediation BTEX concentration goals that are intended to be protective of human health and the environment.

7.3.1 Analytical Protocol

All LTM and POC wells in the LTM program will be sampled and analyzed to determine compliance with chemical-specific remediation goals and to verify the effectiveness of intrinsic remediation at the site. Groundwater level measurements will be made during each sampling event. Groundwater samples from LTM and POC wells will be analyzed for the parameters listed in Tables 7.1 and 7.2, respectively. A site-specific SAP should be prepared as part of a remedial action plan (in compliance with state requirements) prior to initiating the LTM program.

7.3.2 Sampling Frequency

Each of the LTM sampling points will be sampled once each year for an estimated maximum of 18 years. The POC wells should be sampled in year 1 and then annually for 14 years beginning in year 5. If the data collected during this time period support the anticipated effectiveness of the intrinsic remediation alternative at this site, the sampling frequency can be reduced to once every other year for all wells in the LTM program, or eliminated. If the data collected at any time during the monitoring period indicate the need for additional remedial activities at the site, sampling frequency should be adjusted accordingly.

TABLE 7.1 LONG-TERM GROUNDWATER MONITORING ANALYTICAL PROTOCOL PUMPHOUSE 75 INTRINSIC REMEDIATION TS MACDILL AIR FORCE BASE, FLORIDA

				Recommended		Field or
				Frequency of	Sample Volume, Sample	Fixed-Base
Analyte	Method/Reference	Comments	Data Use	Analysis	Container, Sample Preservation	Laboratory
Ferrous Iron	Colorimetric	Field only.	Elevated ferrous iron	Every year for 18	Collect 100 milliliters (mL) of	Field
(Fe ²⁺)	A3500-Fe D		concentrations may be	years	water in a glass container;	
			indicative of the anaerobic		acidify with hydrochloric acid	
			biodegradation process of iron		per method.	
			reduction.			
Ferrous Iron	Colorimetric	Alternate method;	Same as above.	Every year for 18	Collect 100 mL of water in a	Field
(Fe ²⁺)	Hach 25140-25	field only.		years.	glass container.	
Temperature	E170.1	Field only.	Metabolism rates for	Every year for 18	V/A	Field
			microorganisms depend on	years.		
			temperature.			
Dissolved	Dissolved oxygen	Refer to	The oxygen concentration is a	Every year for 18	Collect 300 mL of water in	Field
Oxygen	meter	Method A4500	data input to the Bioplume II	years.	biochemical oxygen demand	
		for a comparable	model; concentrations less than		bottles; analyze immediately;	
		laboratory	1 mg/L generally indicate an		atternately, measure dissolved	
		procedure.	anaerobic pathway.		oxygen in situ.	
Hd	E150.1/SW9040,	Protocol/Handbook	Aerobic and anaerobic	Every year for 18	Collect 100-250 mL of water in	Field
	direct reading meter	methods".	processes are pH-sensitive.	years.	a glass or plastic container;	
					analyze immediately.	
Conductivity	E120.1/SW9050,	Protocol/Handbook	General water quality	Every year for 18	Collect 100-250 mL of water in	Field
	direct reading meter	methods.	parameter used as a marker to	yen.	a glass or plastic container.	
			verify that site samples are			
			obtained from the same			
			groundwater system.			
Nitrate (NO ₃ -1)	IC method E300 or	Method E300 is a	Substrate for microbial	Every year for 18	Collect up to 40 mL of water in a	Fixed-base
	method SW9056;	Handbook method;	respiration if oxygen is	yean.	glass or plastic container; cool to	
	colorimetric,	method SW9056 is	depleted.		4°C; analyze within 48 hours.	
	method E353.2	an equivalent				
		procedure.				

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TABLE 7.1 (Continued) LONG-TERM GROUNDWATER MONITORING ANALYTICAL PROTOCOL PUMPHOUSE 75 INTRINSIC REMEDIATION TS MACDILL AIR FORCE BASE, FLORIDA

				Recommended Frequency of	Sample Volume, Sample	Field or Fixed-Base
Analyte	Method/Reference	Comments	Data Use	Analysis	Container, Sample Preservation	Laboratory
Sulfate (SO ₄ ²)	IC method E300 or	Method E300 is a	Substrate for anaerobic	Every year for 18	Collect up to 40 mL of water in a	Fixed-base
	method SW9056 or	Handbook method;	microbial respiration.	years.	glass or plastic container; cool to	or field (for
	Hach	method SW9056 is			4. C.	Hach
	SuifaVer 4 method	an equivalent				method)
		procedure. Hach				
		method is				
		Photometric.				
Redox potential	A2580 B	Measurements	The redox potential of	Every year for 18	Collect 100-250 mL of water in a	Field
		are made with	groundwater influences and is	years.	glass container, filling container	
		electrodes; results	influenced by biologically		from bottom; analyze	
		are displayed on a	mediated reactions; the redox		immediately.	
		meter; samples	potential of groundwater may		,	
		should be protected	range from more than 200 mV			
		from exposure to	to less than -400 mV.			
		atmospheric				
		oxygen.				
Methane	RSKSOP-114 modified	Method published	The presence of methane	Every year for 18	Collect water samples in 40 mL	Fixed-base
	to analyze water	and used by the	suggests BTEX degradation via	years.	volatile organic analysis (VOA)	
	samples for methane	USEPA National	an anacrobic pathway utilizing		vials with butyl gray/Teflon-lined	
	by headspace sampling	Risk Management	carbon dioxide (carbonate) as		caps (zero headspace); cool to	
	with dual thermal	Research	the electron acceptor		4 •0.	-
	conductivity and flame	Laboratory.	(methanogenesis).			-
	ionization detection.					
Aromatic	Purge and trap GC	Handbook method;	BTEX is the primary target	Every year for 18	Collect water samples in a 40 mL	Fixed-base
hydrocarbons	method SW8020.	analysis may be	analyte for monitoring natural	years.	VOA vial with zero headspace;	
(BTEX)		extended to higher	attenuation; BTEX		cool to 4°C; add hydrochloric	
		molecular weight	concentrations must also be		acid to pH <2.	
		alkylbenzenes.	measured for regulatory			
			compliance.			

al Protocol methods are presented by Wiedemeier et al. (1995).

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TABLE 7.2 POINT-OF-COMPLIANCE GROUNDWATER MONITORING ANALYTICAL PROTOCOL PUMPHOUSE 75 INTRINSIC REMEDIATION TS MACDILL AIR FORCE BASE, FLORIDA

Analyte Meth Temperature E170.1				Recommended	Sample Volume, Sample	Field or
in in				Frequency of	Container, Sample Preservation	Fixed-Base
	Method/Reference	Comments	Data Use	Analysis		Laboratory
		Field only.	Well development and purging.	initially in year 1 and annually in years 5-18 of the LTM program.	N/A	Field
Dissolved Dissol Oxygen meter	Dissolved oxygen meter	Refer to method A4500 for a comparable laboratory procedure.	The oxygen concentration is a data input to the Bioplume model; concentrations less than 1 mg/L generally indicate an anacrobic pathway.	Initially in year 1 and annually in years 5-18 of the LTM program.	Collect 300 mL of water in biochemical oxygen demand bottles; analyze immediately; alternately, measure dissolved oxygen in situ.	Field
pH E150.1	E150.1/SW9040, direct reading meter	Protocol/Handbook methods ".	Aerobic and anaerobic processes are pH-sensitive.	Initially in year 1 and annually in years 5-18 of the LTM program.	Collect 100-250 mL of water in a glass or plastic container; analyze immediately.	Field
Conductivity E120.1 direct	E120.1/SW9050, direct reading meter	Protocol/Handbook methods.	General water quality parameter used as a marker to verify that site samples are obtained from the same groundwater system.	Initially in year 1 and annually in years 5-18 of the LTM program.	Collect 100-250 mL of water in a glass or plastic container.	Field
Redox potential A2580 B		Measurements are made with electrodes; results are displayed on a meter; samples should be protected from exposure to atmospheric oxygen.	The redox potential of groundwater influences and is influenced by biologically mediated reactions; the redox potential of groundwater may range from more than 200 mV to less than -400 mV.	Initially in year 1 and annually in years 5-18 of the LTM program.	Collect 100–250 mL of water in a glass container, filling container from bottom; analyze immediately.	Field
Aromatic Purge hydrocarbons method (BTEX)	Purge and trap GC method SW8020	Handbook method; analysis may be extended to higher molecular weight alkylbenzenes.	BTEX is the primary target analyte for monitoring natural attenuation; BTEX concentrations must also be measured for regulatory compliance.	Initially in year 1 and annually in years 5-18 of the LTM program.	Collect water samples in a 40 mL VOA vial with zero headspace; cool to 4°C; add hydrochloric acid to pH <2.	Fixed-base

Protocol methods are presented by Wiedemeier et al. (1995).

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SECTION 8

CONCLUSIONS AND RECOMMENDATIONS

This report presents the results of a treatability study conducted to evaluate the use of intrinsic remediation for remediation of fuel-hydrocarbon-contaminated groundwater in the vicinity of Pumphouse 75 at MacDill AFB, Florida. Specifically, the finite-difference groundwater model Bioplume II was used in conjunction with site-specific geologic, hydrologic, and laboratory analytical data to simulate the migration and biodegradation of fuel hydrocarbon compounds dissolved in groundwater. To collect the data necessary for the intrinsic remediation demonstration, Parsons ES researchers collected soil and groundwater samples from the site. Physical and chemical data collected under this program were supplemented (where necessary) with data collected during previous site characterization events and with reasonable literature values.

Comparison of BTEX, electron acceptor, and biodegradation byproduct isopleth maps for Pumphouse 75 provides strong qualitative evidence of biodegradation of BTEX compounds (Section 4). Geochemical data strongly suggest that biodegradation of fuel hydrocarbons is occurring at the site primarily via the anaerobic processes of sulfate reduction and methanogenesis.

Site-specific geologic, hydrologic, and laboratory analytical data were used in the Bioplume II numerical groundwater model to simulate the effects of advection, dispersion, sorption, and biodegradation on the fate and transport of the dissolved BTEX plume. Extensive site-specific data were used for model calibration and implementation. Model parameters that could not be obtained from existing site data were estimated using common literature values for aquifer materials similar to those found at the site. Conservative input parameters were used to construct the Bioplume II model for this study, and therefore, the model results presented herein are conservative (i.e., the plume should not migrate further than predicted by the models).

For one simulation (model PH75A), it was assumed that BTEX dissolution from source area soils into groundwater would naturally decrease at a rate of 15 percent per year (each concentration was decreased by a factor equal to 15 percent of the previous year's concentration). The results of this model suggest that the plume would reach the downgradient boundary of the model grid after 14 years of simulation time, with BTEX concentrations at this boundary peaking at 8 ug/L in year 17 and decreasing to 2 ug/L in year 20. The model also predicts that maximum BTEX concentrations in the plume would decrease to below 50 μ g/L by simulation year 14, and to 3 μ g/L by simulation year 20.

Model PH75B assumes that complete source removal via application of an engineered remedial technology such as bioventing would significantly reduce BTEX dissolution from residual LNAPL after 3 years. This assumption is consistent with bioventing results at similar sites (Patrick AFB, Florida). Results of this model suggest that the plume will migrate no further than approximately 550 feet beyond the estimated March 1995 plume front, and after simulation year 12 the plume will recede toward the source area due to the effects of dilution and biodegradation. This model also predicts that maximum dissolved BTEX concentrations in the plume will decrease to below 50 μ g/L by simulation year 8, and the plume will completely disappear by simulation year 16.

Model PH75C assumes that limited bioventing is performed in the vicinity of seven model grid cells, where the most significant soil contamination appears to be located. The results of this model are very similar to those of model PH75B, suggesting that, if bioventing is performed, it should be limited to the area near and between monitoring wells MD75-MW04 and MD75-MW08.

The results of this study suggest that natural attenuation of BTEX compounds is occurring at Pumphouse 75 to the extent that the dissolved concentrations of these compounds in groundwater should be reduced to levels below current regulatory guidelines before potential downgradient receptors could be adversely affected (i.e., the potential contaminant migration pathway should not be completed for any of the potential receptors described in Section 6.2). Model results suggest that LTM and institutional controls may be required for as long as 18 years if an engineered remedial action is not implemented to supplement the effects of intrinsic remediation. If an engineered remedial action is implemented in the source area, then the model results suggest that LTM and institutional controls may be required for approximately 12 years.

The Air Force recommends intrinsic remediation, institutional controls, and LTM as the remedial option for BTEX-impacted groundwater at the site. The projected additional cost of source removal via bioventing is not justified by the estimated 6-year reduction in remediation time resulting from the implementation of source removal activities. Groundwater use in and downgradient from the plume area should be restricted for a period of at least 18 years. In addition, proper health and safety precautions should be followed in the event that excavation is performed in the contaminated area. However, engineered source reduction via a combination of bioventing and biosparging should be considered as a contingency in the event that land use in this area changes to commercial or residential, or if measured BTEX reductions in the groundwater are substantially slower than predicted by the Bioplume model. In addition, if a substantial length of the fuel pipelines is exposed in the near future to detect and repair leakage, then consideration should be given to installing a bioventing/biosparging system in the resulting excavation.

To verify the results of the Bioplume II modeling effort, and to ensure that natural attenuation is occurring at rates sufficient to protect potential downgradient receptors, groundwater from six existing monitoring wells and five additional proposed LTM wells should be sampled annually for 18 years and analyzed for the parameters listed in Table 7.1. In addition, four POC groundwater monitoring wells should be installed downgradient from the predicted maximum travel distance of the BTEX plume. These

wells should be sampled once immediately following their installation to ensure that they are not being impacted by a second contaminant source, and then sampled annually for 14 years beginning in year 5 of the LTM program. Target analytes for POC samples are listed in Table 7.2. Figure 7.1 shows suggested locations of the existing and proposed LTM and POC wells. If dissolved BTEX concentrations in groundwater in the POC wells exceed state guidelines for no further action of $50 \,\mu\text{g/L}$ for benzene and total BTEX, then additional evaluation or corrective action may be necessary at this site. Once it is decided that the groundwater monitoring points installed for this study will not be used for future resampling, they should be abandoned according to state requirements.

A site-specific remedial action plan, including a detailed SAP, should be submitted to the Florida DEP for approval prior to implementation of the recommended remedial alternative for Pumphouse 75.

The vertical migration of dissolved BTEX within the shallow surficial aquifer at Pumphouse 75 should be investigated further prior to full implementation of the LTM plan described in Section 7. As described in Section 4.3.1, BTEX concentrations in groundwater samples from two wells screened in sand, clay, and limestone layers at or beneath the base of the surficial aquifer increased substantially from November 1994 to March 1995. These deep detections may be at caused in part by cross contamination from shallow intervals during well purging. To test this hypothesis, wells MD75-MW14 and MD75-MW16 could be sampled using the micropurge method described by Kearl et al. (1994). This approach, which is based on the premise that stagnant water in the well casing does not completely mix with groundwater flowing through the screen, would require the installation of a low-flow sampling pump in the screened intervals of these wells. Ambient groundwater inflow should be sufficient to supply water to the pump, preventing mixing with stagnant water from the well casing, and only the sample tubing and pump would be purged. The extremely low purge volume and rate would minimize drawdown in the well casing and assure that cross contamination is not occurring. If this sampling indicates that significant contaminant concentrations are present in these deeper zones, then monitoring of these zones should be included in the LTM plan. The cost of performing this sampling is not included in the groundwater monitoring costs provided in Section 6.

SECTION 9

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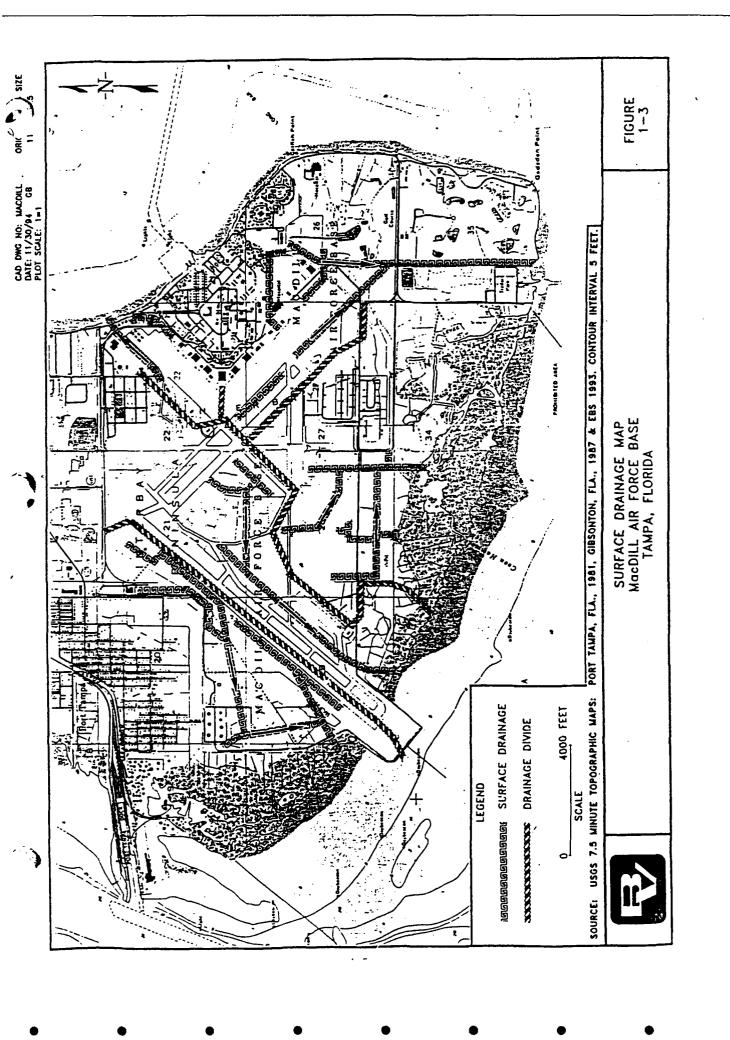
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APPENDIX A

INFORMATION FROM THE DRAFT CONTAMINATION ASSESSMENT REPORT (BVWS, 1995)



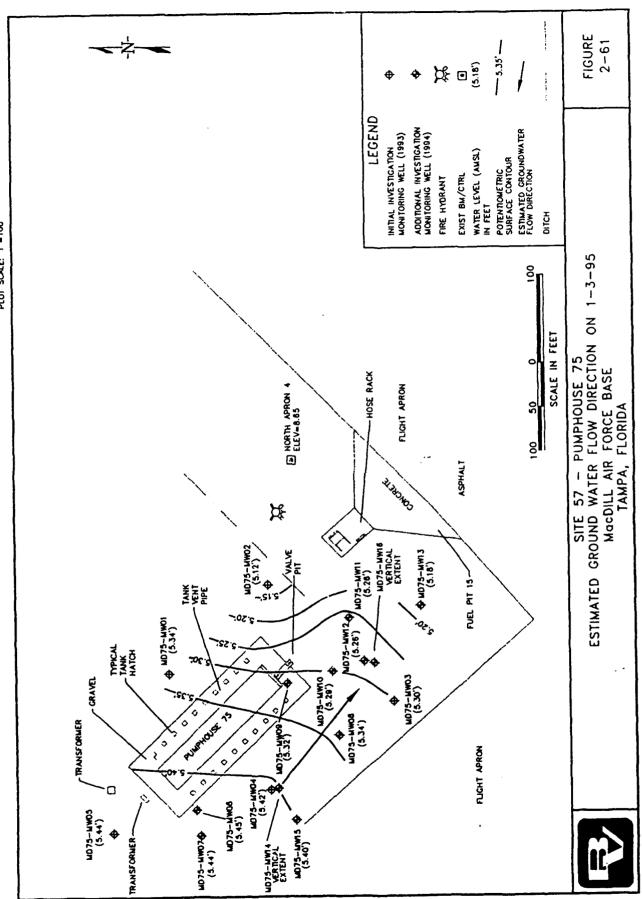
WATER LEVEL (AMSL) IN FEET (6.06") FIGURE 2-60 -00.9-**;**;; ESTIMATED GROUNDWATER FLOW DIRECTION ADDITIONAL INVESTIGATION MONITORING WELL (1994) INITIAL INVESTIGATION MONITORING WELL (1993) LEGEND 8.5 x 11 POTENTIOMETRIC SURFACE CONTOUR DITCH EXIST BM/CTRL FIRE HYDRANT CAD DWG NO: 5775WF-A DATE: 1-16-95 PLOT SCALE: 1"=100" SITE 57 - PUMPHOUSE 75 & FUEL PIT 15 ESTIMATED GROUND WATER FLOW DIRECTION ON 10-22-94 MacDILL AIR FORCE BASE <u>8</u> SCALE IN FEET HOSE RACK S NORTH APRON 4 ELEV-8.65 PLICHT APRON TAMPA, F' "RIDA 읾 ASPHALT Õ *Light Moo ĬŢ. VALVE WW13 (5.91°) ₩¥0 PENT PE FUEL PIT 15-LWN6 VERTICAL EXTENT **♦** WW12 **♦** (5.99') ₩WO1 (6.00') TYPICAL TANK HATCH ₩. 6.06. 6.06. 20 GRAVEL PURPOUT TO NW03 -6.00 -TRANSFORMER (6.01°) 6.05 þ FLICHT APRON (6.04) ₩Q EXERT EXE MW07 ♦ (6.12) TRANSFORMER-(6.14)

ORIGINAL DWG SIZE

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2,110



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Table 2-81 Subsurface Soil Analytical Results Initial Investigation

Site 57 -- Pumphouse 75, MacDill Air Force Base

Parameters	FDEP Clean-up Goals	MD75- MW01 (2-3) ¹	MD75- MW01 (DUP)	MD75- MW02 (2-3) ¹	MD75- MW03 (2-3) ¹	MD75- MW04 (2-3) ¹	MD75- MW05 (2-3) ¹		
Halogenated Volatiles (p	rg/kg)(method	8010)							
Methylene Chloride	1.13			6.0B	10.8B	6.6B	5.3B		
1,1-Dichloroethene	NE		-				1.3		
Total VOHs ²	NE	-		-	•-		1.3		
Aromatic Volatiles (µg/k	g)(method 802	0)							
Chlorobenzene	NE	54,800JH,M	75,800JH,M			-	-		
1,2-Dichlorobenzene	NE	48,200JH,M	84,300JH,M	_	-	-			
1,3-Dichlorobenzene	NE	31,400JH,M	_	_			-		
1,4-Dichlorobenzene	NE	35,700JH,M	59,400JH,M		-		-		
Benzene -	0.386	1,800JH	2,850JH						
Ethylbenzene	72.7	25,900JH	72,200JH		-	-			
Toluene ~	NE	11,300JH	19,600JH	0.9 J	-		0.8 J		
Xylenes (Total) -	NE	51,100JH	85,200JH				_		
Total VOAs ^{2,3}	NE	90,100JH	179,850JH	0.9J			0.8J		
PAH (µg/kg)(method 81	00)				<u> </u>				
Acenaphthylene	NE	-		_		97			
Total PAHs ^{2,4}	NE		-	-		97	-		
TRPH (mg/kg)(method 418.1)									
TRPH ²	NE	33,000	18,000	-		_	-		
RCRA Metals (mg/kg)									
Barium (method 6010) ²	NE	9.2	9.2	2.8	5.5	5.0	3.2		
Chromium (method 6010) ²	382	5.3B	5.4B	2.7B	6.8B	3.1B	3.8B		
Lead	NE	2.7	2.8	1.9	1.8	1.4	0.8		
Mercury (method 7421) ²	NE	0.381	-	_	0.129	-			

NOTES:

FDEP Clean-up Goals

Florida Department of Environmental Protection clean-up goal for soils at the DOD Sites in Florida. Values for leachability and general worker (carcinogenic and non carcinogenic) were compared and the lowest selected.

MW Monitoring Well.

NE Not Established.

Below detection limits.

Possible false positive based on blank contamination. Blank contaminants are not included in totals.

Estimated quantitation based on QC data.

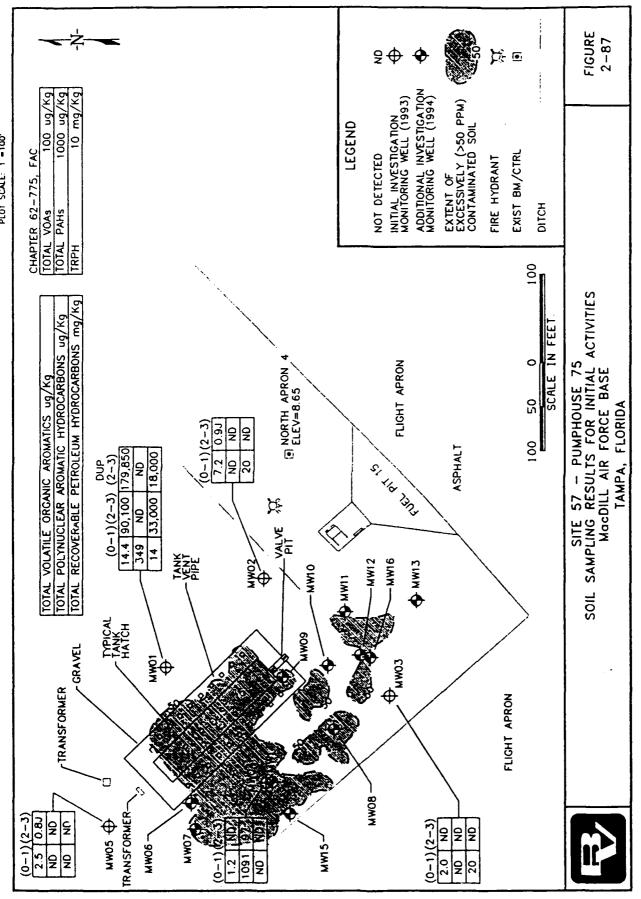
M Method results conflict; not quantifiable due to coelution of peaks.

JH Possibly biased high based on surrogate recovery. Soil sampling interval in feet below land surface.

Chapter 62-775, F.A.C., Soil Thermal Treatment criteria: total VOHs (50 ppb), total VOAs (100 ppb), total PAHs (1000 ppb), TRPH (50 ppm),s lead (108 ppm), barium (4,940 ppm), chromium (50 ppm), and mercury (23 ppm).
Total VOAs include BTEX constituents only.

Total PAHs include naphthalenes.





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Table 2-55 Groundwater Analytical Results Initial Investigation

Site 57 -- Pumphouse 75, MacDill Air Force Base

Parameters	Chapter 62-770 F.A.C.	MD75- MW01 (2.5-11.48) ¹	MD75- MW02 (2.41-11.38) ¹	MD75- MW03 (2.5-11.48) ¹	MD75- MW04 (2.5-11.48) ¹	MD75- MW05 (2.5-11.48) ¹
Halogenated Volatiles (me	thod 8010) (j	ug/L)				
Methylene Chloride	NE	0.8JB	0.8JB	1.1	••	0.7B,J
Aromatic Volatiles (metho	od 8020) (µg/I	-)				
1,2-Dichlorobenzene	NE	-			11.2JM	
Benzene	1				187	
Ethyl benzene	NE				884	
Total VOA ²	50			-	1071	-
PAH (method 8100) (μg/I				-		
Acenaphthyene	NE	-	-	-	91.5	-
Total PAHs ³	10			-	91.5	
Naphthalene	NE	-	-	-	615.2	
1-methylnaphthalene	NE	-		-	105.8	
2-methylnaphthalene	NE	-			108.6	-
Total Naphthalenes ⁴	100			-	829.6	
TRPH (method 418.1) (mg	g/L)					
Pet. Hydrocarbons	5	_	-	-	6.2	**
RCRA Metals (method 60	10) (µg/L)					
Barium	NE	26.2	11.9	44.5	36.7	21.2
Chromium	NE	19.1	10.4	5.6	7.5	18.1
Lead	50	5.9		7.1	3.7	

NOTES:

Chapter 62-770, Chapter 62-770, Florida Administrative Code petroleum contamination cleanup criteria.

MWMonitoring Well. NE

Not Established.

В Possible false positive based on blank contamination.

Estimated quantitation based on QC data.

Method results conflict; not quantifiable due to coelution of peaks.

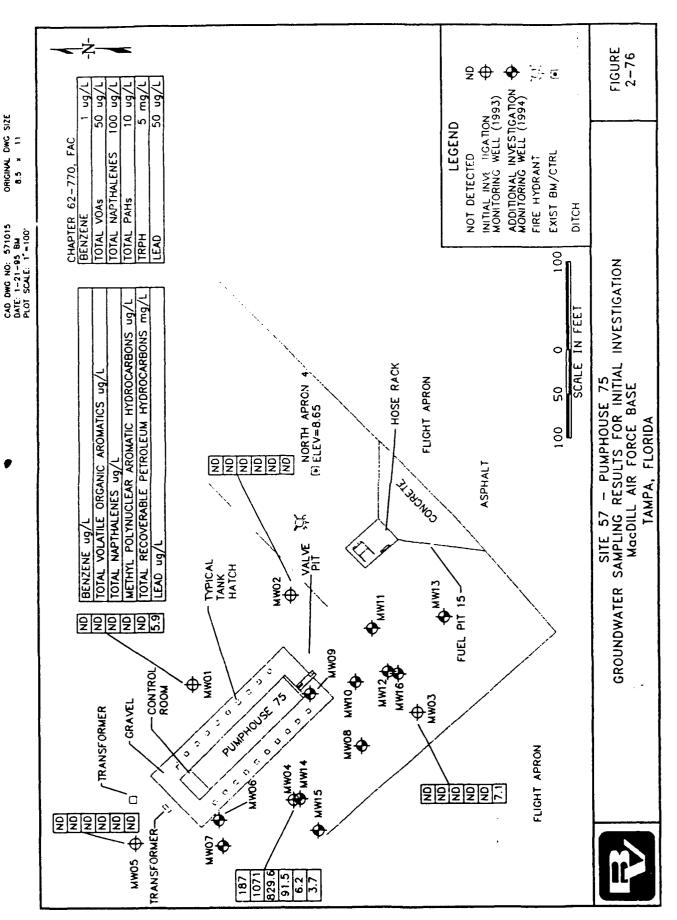
Below detection limits.

Monitoring well screened interval in feet below land surface.

Total VOA includes BTEX constituents only.

Total PAHs excluding naphthalenes.

Total naphthalenes includes 1-methylnaphthalene and 2-methylnaphthalene.



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Parameters	Chapter 62-770	Grou Site MD75-	andwater 57, Pumpt MD75- MW02	Table 2-122 Results - Add nouse 75, MacDi MD75- ME	2-122 Addition MacDill Air MD75- MW04	ndwater Results - Additional Activities 57, Pumphouse 75, MacDill Air Force Base MD75- MD75- MD75- MW04 MW04	es MD75- MW05	MD75-	MD75-	MD75-
Amatic Volatiles (method 8000)	- 1 .	(2.5-11.48)	(2.41-11.38)	(2.5-11.48)	(2.5-11.48)	(DUP)	(2.5-11.48)	(2.48-11.48)	(2.43-11.48)	(2.43-11.4)
1,2-Dichlorobenzene	NE NE		,	:	:	;	:			Me 11
1,3-Dichlorobenzene	NB	:			:	:		:	: :	M979
1,4-Dichlorobenzene	NE	:	:	••		:	:	:	:	MS.VE
Benzene	-	:			135	14	:	:	19.0	174
Ethylhenzene	NE	ı	1	:	841	877	:	:	1.7	091
Toluene	a E	:			:		;	:	:	35.9
NITHE	50		1	••	:	:		:		29.1
	NE	•		•	:	•	:	:		171
Total VOAs2	20	•		:	926	1601	:	:	2.31	540.93
PAII (method 8100) (µg/L)										
Acenaphthylene	SR	:	1	;	15.51	24.1	:	;		4:06
Acenaphihene	N El	:	;	;	7.4	6.7J	:		:	17.3
Pluorene	N E	:	:	:	20.8	45.3	:	,	:	19.7
Phenanthrene	N El	:	:	;	18.8	21.4	:	:	:	13.9
Total PAHs ³	10	•	-		62.5	f5'26	:	:	:	141.3
Naphthalene	NB BN	•	-		572	723	:	:	\$.2B	175
1-Mcthylnapihalene	S.B.	:	:	•	110	150		:	0.53	59.5
2-Mothylnapthalene	NB	ı		•	147	173		:	1.2	39.4
Total Naphthalenc*	100		:	:	829	1046			6.91B	273.9
1RPH (method PPA 418.1) (mg/L.)	(J.)									
	•									1

		(Table	Table 2-122 (Continued)	Continue	G				
		Grour Site	Groundwater Results - Additional Activities Site 57, Pumphouse 75, MacDill Air Force Base	ndwater Results - Additional Activitie 57, Pumphouse 75, MacDill Air Force Base	Addition: MacDill Air	al Activiti Force Base	S 0			
Parameter	Chapter 62-770	MD75- MW01			MD75- MW04	MD75- MW04	MD75- MW05	MD75- MW06		MD75- MW08
RCRA Metals (method 6010) (ug/L)	(HE/L)	(2.5-11.48)	(2.41-11.38)	(2.5-11.48)	(2.5-11.48)	(DOP)	(2.5-11.48)	(2.48-11.48)	(2.43-11.48)	(2.43-11.4)
Barium	NB	8.5	7.4	7.4	25.4	25.8	0.9	10.1	10.6	7.9
Chromium	NB		•	:	:	:		1.0	:	:
Arenic	NE		:	:	:	2.0		:	2.6	:
Lead	50	2.5	3.8	•	:	2.1	:	:	:	;
Mercury	:	•	1	:	:	2.1	:		:	
NOTICE										
FAC 62-770 Chap MW Monit NE Possii D Estirr M Melon Belon 1 1 Monit 2 Total	Chapter 62-770, Florida Administrative Code groundwater standard. Monitoring Well. Not Established. Possible false positive based on blank contamination. Estimated quantitation based on DC data. Method results conflict; not quantifiable due to coelution of peaks. Monitoring Well Screened Interval in feet below land surface. Total VOA includes BTEX constituents only. Total PAIs excluding naphthalenes. Total naphthalenes including naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene.	Administrative Consisted on blank continated on QC data. not quantifiable dual id Interval in feet 1 EX constituents on thinhalenes.	de groundwater standard, amination. Le to coelution of peaks. below land surface. 1y.	andard. peaks. :. nc, and 2-methyln	laphthalenc.					

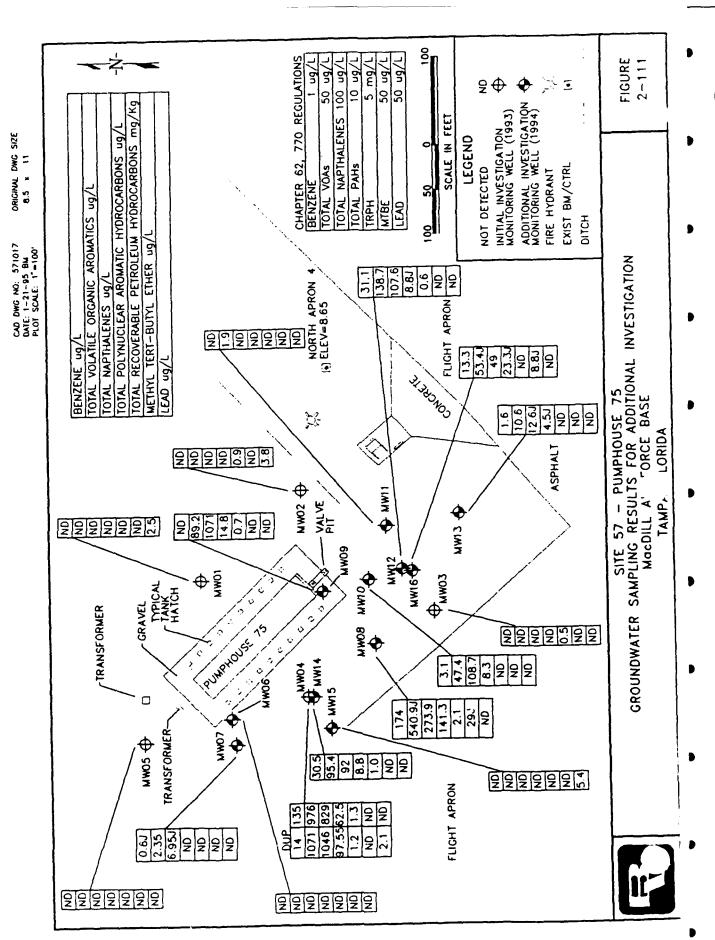
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		Groundy Site 57,	Table 2-122 coundwater Results ite 57, Pumphouse 75,		Table 2-122 (Continued) water Results - Additional Activities Pumphouse 75, MacDill Air Force Base	ctivities e <i>Ba</i> se			
Parameters	Chapter 62-770 FAC	MD75- MW09 (2-10.48)	MD75- MW10 (2-10.48) ¹	MD75- MW11 (1.8-10.77)	MD75- MW12 (2.43-11.40)	MD75- MW13 (2-10.98) ¹	MD75- MW14 (22.86-27.18)	MD75- MW15 (2.5-11.49)	MD75- MW16 (20.84-25.15)
Aromatic Volatites (method 8020)	(07								
1,2-Dichlorobenzene	NE	12.4M	2.7M	0.8M	S.3M	:	:	:	4.1M
1 3 Dichlorobenzene	an			:	S.9M	:	:	:	0.6M
1,4-Dichlorobenzene	NE			:	22.3M	:	:	:	M6.0
Benzene	1	:	3.1	••	31.1	9.1	30.5	••	13.3
Ethylbenzene	NE	81.2	44.3	**	73.3	6.8	6.4.9	:	32.8
Toluche	NE	-			:	:	••		0.5.1
MTBE	50	:	•	••	•	•	••	**	8.8.1
Xylenes (Total)	NB	88		1.1	34.3	2.2	••		8.9
Total VOAs2	50	89.2	47.4	1.9M	138.7	10.6	95.4	:	53.41
1-A11 (method 8100) (µg/L.)									
Acenaphthylene	NE	14.8	1.7	:	161	0.8J	1.8	:	3.6
Accnaphthene	NR	-	1.4	:		2.2	5.3		11.5
Anthracene	NE	•	:	••		0.83	•	••	0.8.1
Fluorenc	NE	:	3.6	••	3.7	0.73	1.7	••	5.2
Phenanthrene	10	:	1.6	••	3.2	•	•		2.2
Total PAHs	NE	14.8	8.3		8.81	4.5J	8.8	••	23.3J
Naphthalene	NE	640	61.5		108	2.78	8.89	••	ж
1-Methylnapthalene	NE	204	26.2	-	52.5	9.1	10.7		9.6
2-Methylnapthalene	100	227	21	1	0.91	0.8.1	12.5	:	5.1
Total Naphthalene		1071	108.7	:	9'201	12.6J	92	:	49
'IRPH (method 12PA 418.1) (mg/L.)	eA.)								
тки	5.0	0.7		:	9:0		1.0	:	

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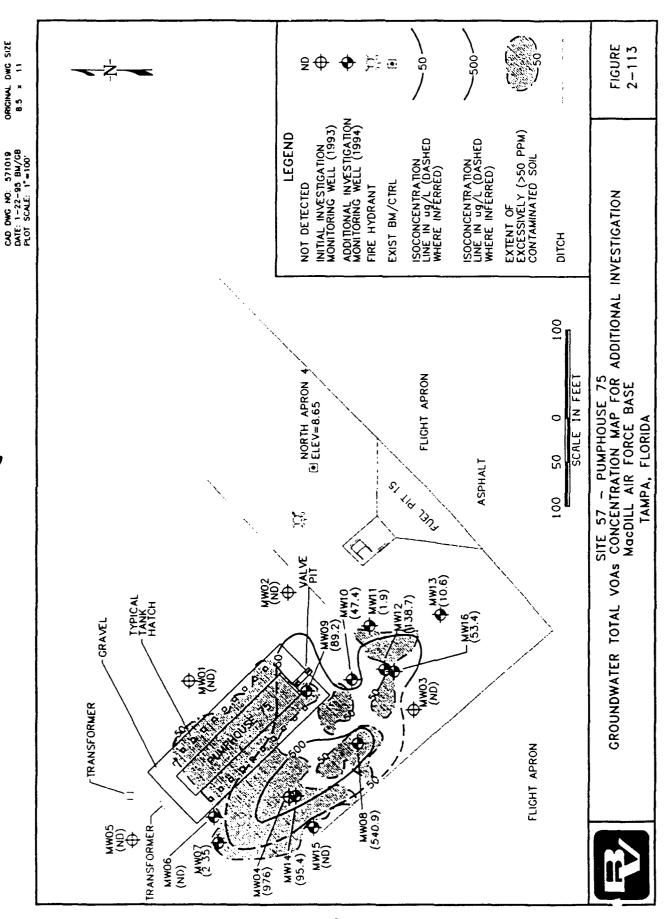
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			Table 2-	Table 2-122 (Continued)	ntinued)				
		Groundv Site 57,	water Re: Pumphous	sults - Ado	aroundwater Results - Additional Activities Site 57, Pumphouse 75, MacDill Air Force Base	ctivities e Base			
Parameters	Chapter 62-770 FAC	MD75- MW09 (2-10.48)	MD75- MW10 (2-10.48)	MD75- MW11 (1.8-10.77)	MD75- MW12 (2.43-11.40) ¹	MD75- MW13 (2-10.98)	MD75- MW14 (22.86-27.18)	MD75- MW15 (2.5-11.49) ¹	MD75- MW16 (20.84-25.15)
RCRA Metals (method 6010) (ugfl.)	(µ g /l.)								
Banum	NB	0.6	15.5	23.0	88	2.5	30.7	5.8	10.3
Свижния	NE	-	2.9	••	7.3	1.1	••	:	:
Acone	NE	2.2		:	:	:	4.9		3.2
Lent	80		:			:	•	5.4	:
Mercury			0.383	**	-	:	••	۶.4	••
NOTES									
FAC 62-770 Chapter May Monit No. E B Fossib J Estim Matter May Below Below Below Below Below Below Below Below A Total	Chapter 62-770, Florida Administrative Coole groundwater standard. Monitoring Well. Not Established. Flossible false positive based on blank contamination. Estimated quantitation based on QC data. Estimated quantitation based on QC data. Monitoring Well Screened Interval in feet below land surface. Monitoring Well Screened Interval in feet below land surface. Total VOA includes BTEX constituents only. Total PAlis excluding naphthalenes. Total naphthalenes including naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene.	Administrative Code grounds sed on blank contamination. ased on QC data. not quantifiable due to coelu d'Interval in feet below land 3X constituents only. phthalenes.	e groundwater st mination. e to coelution of elow land surface ly.	andard. peaks. :. :nc, and 2-methyln	aphthalene.				



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ORIGINAL DWG SIZE

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GEOLOGIC BORING LOG Sheet 1 of 1 BORING NO .: 75MP-1A PARSONS ES 3/11/95 _____CONTRACTOR ____ DATE SPUD: GEOPROBE CLIENT: ____RIG TYPE: ____ DATE CMPL 3/11/95 722450 21 DRLG METHOD: GEOPROBE ELEVATION: JOB NO.: COOL MACDILL AFB BORING DIA .: 2 INCHES TEMP: LOCATION: YCNIW NONE WEATHER: GEOLOGIST: ____ DRLG_FLUID:

Elev	Depth	Pro-	US				Sample			WKSPC	TOTAL	ТРH
(ft)	(ft)	file	cs	Geologic Description	No.	Depth (ft)	Туре	Res	PID(ppm)	PID(ppm)	BTEX(ppm)	(ppm)
	1		SP	t feat of brown TOPSOIL Light brown, fine-grained SAND with silt			С					
<u>_</u>			SW	White to tan, fine— to medium—grained, well—sorted SAND with silt. Subangular grains Saturated at 3.0 feet bgs		3-5	0		7 1	71		
	- 5 -		ļ	Brown, silty SAND to SAND with silt	ļ		N		7.4			
			SP	White, fine-grained, well-sorted SAND					7 1			
			SW	minte, inter-granieo, well-sorted sano			Z					
	10-						0		7 1			
			ļ	Bottom of hole at 13 feet bgs			U S		7 1			
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BACKGROUND PID = 7.1 ppmv

COMMENTS:

GEOLOGIC BORING LOG

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GEOLOGIC BORING LOG

Sheet 1 of 1

PARSONS ES BORING NO : 75MP-18 3/11/95 _____ CONTRACTOR ___ DATE SPUD AFCEE RIG TYPE: GEOPROBE 3/11/95 CLIENT: ____ DATE CMPL 722450 21 DRLG METHOD: GEOPROBE ELEVATION: JOB NO.: COOL MACDILL AFB BORING DIA .: 2 INCHES TEMP: LOCATION: OVERCAST GEOLOGIST: KC ____DRLG_FLUID: NONE ____ _____ WEATHER: BACKGROUND PID = 7.1 ppmv COMMENTS:

Elev	Depth	Pro-	US				Sample			WKSPC	TOTAL	ТРН
(::)	(ft)	file	CS	Geologic Description	No.	Depth (It)	Type	Res	PID(ppm)	PID(ppm)	BTEX(ppm)	(ppm)
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	-15-		ISW	White, fine- to medium-grained, well-sorted SAND with silt. Saturated Slight odor Saturated at 3.0 feet bgs			<u>_</u> .		01.4			-
	ļ			Saturated at 3.0 feet bgs			C		21.4			
		! }				-	0					
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	 20-					}	E		71			
			CH	Light brown, stiff, sandy CLAY - Moderate plasticity	İ							
	ļ		SP	Greyish-green, clayey SAND Saturated	4				21 4			
	L		l	Bottom of hole at 22 feet bgs	1							
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SAMPLE TYPE

D - DRIVE

C -- CORE

G - GRAB

Water level drilled

GEOLOGIC BORING LOG

Intrinsic Remediation TS Macbill Air Force Base, Florida

PARSONS ENGINEERING SCIENCE, INC.

Denver, Colorado

		GEOLOGIC	BORING LO	G	Sheet 1 of 1
BORING NO :		CONTRACTOR		DATE SPUD DATE CMPL	3/13/95 3/13/95
JOB NO.:		DRLG METHOD:		ELEVATION:	
LOCATION:	MACDILL AFB	BORING DIA.:	2 INCHES	TEMP:	
	KC BACKGROUND PID =	DRLG FLUID: 4.3 ppmv	NONE	WEATHER:	

	Depth	1	US				Sample			WKSPC	IATOI	TPH
(ft)	(ft)	file	CS	Geologic Description	No	Depth (ft)	Туре	Res	PtD(ppm)	PID(ppm)	B1EX(ppm)	(ppm)
	- 1		SW	3 to 5 inches of topsoil and FILL with roots White to tan, fine— to medium-grained, well-sorted SAND with silt. Strong hydrocarbon odor Saturated at 3.0 feet bgs.			С		30 4			
<u> </u>		ş:		Saturated at 50 reet bys	1	2-4	S		326			
	- 5 -						T		4 3			
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NOTES SAMPLE LYPE

bgs - Below Ground Surface D - DRIVE

TOO - Top of Casing 170 - Not sampled

GEOLOGIC BORING LOG

Intrinsic Permediation IS MacDill Air Force Base, Flor ac

PARSONS ENGINEERING SCIENCE, INC.

Server, Colorado

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		GEOLOGI	C BORING LC)G	Sheet 1 of 1	!
BORING NO:	75MP 3	CONTRACTOR	PARSONS ES	DATE SPUD	3/14/95	
CLIENT:	AFCEE		GCOPPOBE			
			GEOPPOBE			
LOCATION:	MACDILL_AFB	BORING DIA.	2 INCHES	TEMP:	WAPM	
GEOLOGIST:	₩C	DRLG FLUID:	NONE	WE A THEFO	SUNNY	
COMMENTS:	BACKGROUND PID =	0.3 ppmv				.

[E ev	Depth	Pro-	US			ample	Sample	Peret	Ī	WKSPC	TOTAL	TFH
χ(t)	(ft)	file	CS	Geologic Description	No	Depth (ft)	Туре	Res	PILI(ppm)		BiEX(ppm)	(ppm)
	1 -	 	SP	4 to 8 inches of topson Dark brown, time grained sitty SAND with clay saturated at 3.0 feet bas	-					I		
	' 		1.31	Saturated at 30 feet bas	İ		C		0.3	0.5		
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GEOLOGIC BORING LOG

Intrinsia Remediation T MacDill As Fore Base, Francis

PARSONS ENGINEERING SCIENCE, INC.

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SORING NO	. 75 v	P-4	CONTRACTOR PARSONS ES	3	()	ATE	SPUE).	3/14/9	95,	
LIENT	AFC		RIG TYPE: GEOPROBE		0	ΑTE	CMPI	_	3/14/9	95	
108 NO:		450 2			E.		HON:				
OCATION:			AFB BORING DIA : 2 INCHES		T			-	HOT		
RECLOGIST:	KC_		DRLG FLUID: NONE JUND PID =0.3 ppmv		W	ÆATH	ÆR:		SUNNY		<u>-</u>
OMMENTS:	-BHC	KURL	OND FID =0.3 ppmv							· · · · ·	
flev Depth	Pro-	US		5	ample	Sample	Penet		MKZEC	TOTAL	IPH
(11) (11)	file	CS	Geologic Description	No) PID(ppm)	BTEX(ppm)	(ppm)
- ' -		SP	6 inches of brown sandy TOPSOIL Dark brown, the-grained silty SAMD with hydrocarbun			i.		887		ļ	
		SW	odor Ton fine- to medium-grained, well-sorted SAND with							 	
\blacksquare		2 AA	some sitt. Moderate hydrocarbon odor			N		599			
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			SAA with slight hydrocarbon odor. Saturated		6 40			16			
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PARSONS ENGINEERING SCIENCE, INC.

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BORING NO: CLIENT LOB NO: LOCATION: CEULOUIST. COMMENTS.	AFCEE			E 	TEMP: NEATi	EMF1 TION HER	· G	ELEKZ SZ 1 SZ II SVERČÁ	lfs 	
E ev Depth F	5-3 105	Ţ · · · ·		Just je	nample	Penel	Ţ ·	WKSP(IntA _L	16
100		Geologic Description	N	Depth (ft	Type	Feg.	Pili(ppm)	EdD(blim)	BlExippm)	(ppm)
	SE	Core brown, sand, Fitt and THESB, to 6 in hes sight brown, fine i to medium-grained SAND with sit Moderate hydrocarbon adar			Ç.	‡ †				
				<u> </u>				·		
		Saturated at 3.5 feet bys Tan, fine-grained, well-scried SAND Odor present	,	3-5	N		160.8	-		-
	SW	very small recovery			1 Ī					-
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f = 1 (r)	11.	er .	Ιψ,] · c	gmple	Sample	Penet		 WKSPC	TOTAL	Tran
	. ; !	tile	(5)	Geologic Description	N.	Depth (11	Type	Res	Pili(ppm)	PID(ppm)	BIEX(ppm);	(ppm)
. 1	7		50	4 to 5 in two of trawn sandy FILL Lines trawn it eligrained SANE with tan sand stringers								
	:			Lan fine to medium-project subandular SANG			\downarrow () \downarrow	i i				
. r			'5W	Tran, fine into medium-grained, subungulor SANU Strung hydrocurbun oddr Gazurated at 7.0 feet bas	1	5.5			734			
·+	1			SAA moderate hydrocarbon odor and nonts present	ļ	ļ		!	239.1	ļ		
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	•		r Sirt	. are brown, tree-grained sity (#4). Milderate hydrocarbon Ladar present					47.9			
!	•	-	•	I Jan The Its medium grained, well sorted SAND					130	 		
	•		· W	Tan fine its medium grained, well sorted SAND Moderate hydrocarbon odos and woody noots present		9-11						
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PARSONS ENGINEERING SCIENCE, INC.

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			GEOLOGIC BONI	ING	_LU	<u></u>			وسيده وا	t 1 o	' 1
DRIME NO	759	.5 - 3	CONTRACTOR PARSONS E	S	[.	AI:	i 1,11	;	13/9	15	
ĘNT.	AFC		RIG TYPE GEOFROSE		[3/13/9	<u></u>	
B NO:	72		DRIG METHOL GEOPROFE								
A FON:			AFB BORING DIA : 2 INCHES			EME			VARM		
JLOGIST:	k C		DRLG_FLUID: NONE			VE A TH		(LEAR		
MMENTS:	ÐΑ	CNGRO	OUND PID = 4.3 ppmv								
											*
ev Depth		t		L		Sample		1	WKSPC	TOTAL	ifr :
ft) (ft)	_file_	CS	Geologic Description	No	Depth (ft)	Type	Res	PID(ppm)	PID(ppm)	BTEX(ppm)	(tttm)
- 1 -		SP	Tan, fine- to medium-grained SAND with some silf					ļ	!	ļ	<u> </u>
			Tan, tine - to medium-grained, subangular SANO								
<u> </u>		SW	More well sorted Saturated at 3.0 feet bas		3-4			00			
		!	Salaronco de portecto aga	'	†	N					.
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ECPFOBE INCHES ONE Solution S	umple	LEVA TEMP: WEATH	TION: IER:				
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GEOLOGIC BORING LOG	Sheet 1 of 1
BORING NO : 7585-5 (FINT-1) CONTRACTOR PARSONS ES DATE SPUB 3	/14/95
CLIENT: AFCEE RIG TYPE: GEOPROBE DATE (MEL 3)	
JOB NO: 722450.21 DRLG METHOD: GEOPPOBE FLEVATION	
	UNNY
COMMENTS: BACKGROUND PID = 0.3 ppmv	

lev	Depth	Pro-	US			ample	Sansile	Penet		WKSPC	TOTAL	lind
(ft)	(ft)	file	CS	Geologic Description	No	Depth (ft)	Type	Res	Plū(ppm)	PID(ppm)	BTEX(ppm)	(ppm.)
	1 ,			No sample		7			11		1	
	<u> </u> 1						(i	
			CIAL	Tan, fine— to medium-grained, well-sorted, SAND Some silt present			()		1		<u> </u>	
V			SW	Saturated at 4.0 feet bgs	İ		1 1		0.9			
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	-	and the second s

GEOLOGIC BORING LOG

		GEOLOGI	C BORING LC)G	Sheet 1 of 1
BORING NO :	75SS6	CONTRACTOR	PARSONS ES	DATE SPUD	3/15/95
CLIENT	AFCEE	.RIG TYPE:	GEOPROBE	DATE CMPL	3/15/95
JOB NO.:	722450 21	DRLG METHOD:	GEOPROBE	ELEVATION:	
LOCATION:	MACDILL AFB	BORING DIA:	2 INCHES	TEMP.	
			NONE	WEATHER:	OVERCAST
COMMENTS:	BACKGROUND PID =	60 ppm.			

Elev	Depth	Pro-	US		5	umple	Sample	Penel	Ī	WKSPC	101AL	TPH
(ft)	(ft)	file	CS	Geologic Description	No	Depth (ft	Type	Res	PID(ppm)	PID(ppm)	BTEX(ppm)	(ppm
	- 1		SP	Dark brown, sandy FILL and TOPSOIL to 6 inches Brown, fine— to medium-grained SAND with silt Roots present			C		60	60		
Ţ			SW	Tan, fine— to medium-grained, well-sorted SAND Organic odor present - Saturated at 3.0 feet bgs	-		0		6 C			
_	- 5 -		SP	Brown sitty SAND as above	1	3-5	N					
			SW	White, fine— to medium—grained, well—sorted SAND Organic ador present					€0			· · · · ·
	-		J 11	Organic Good present	2	7-9	N		60	60		
	10-			No sample from 10 to 15 feet bas					60			
				The somple worth to to 15 teet bys			`~' '					
							S					
	15-		SP	Brown, silty SAND as above - Odor present			ر.					
			25	No sample from 17 to 18 feet bgs			ŏ		201 1			
			SP	Brown silty SAND as above			R					
···	-20-		SW	White well-sorted SAND as above. Strong ador present			E		>1000	60		
					-	ļ			1871			
					3	22-24			>1000	60		
	-25-								80.6			
			SP	Light brown, fine-grained silty, clayey SAND Moderately plastic			 		6 J			
				Bottom of hole at 28 feet ags								
	- 30 -											
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		일 1일	SAMPLE FIPE
t jr.		Below Ground Surface	D - DRIVE
0.5		Ordand Surface	C CORE
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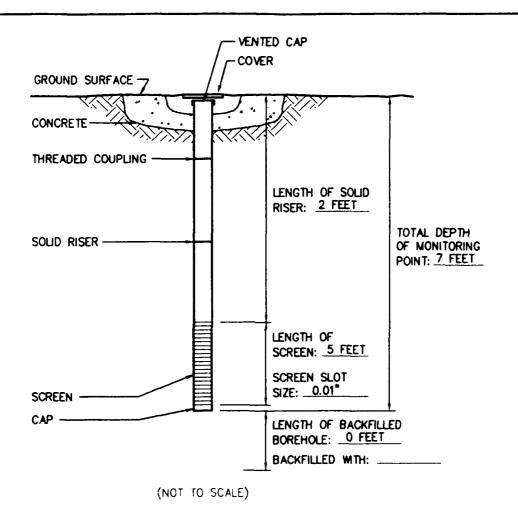
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GEOLOGIC BORING LOG

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PARSONS ENGINEERING SCIENCE, INC.

MONITORING POINT INSTALLATION RECORD JOB NAME MACDILL AIR FORCE BASE MONITORING POINT NUMBER 75MP-1S JOB NUMBER 722450.21 INSTALLATION DATE 3/11/95 LOCATION SITE 57 DATUM ELEVATION 9.165 FEET ABOVE MSL WELL CASING ELEVATION 9.011 FT AMSL DATUM FOR WATER LEVEL MEASUREMENT GROUND SURFACE SCREEN DIAMETER & MATERIAL 1.0 INCH PVC SLOT SIZE 0.01 INCH RISER DIAMETER & MATERIAL 1.0 INCH PVC BOREHOLE DIAMETER 2 INCHES GEOPROBE CONTRACTOR PARSONS ENGINEERING SCIENCE ES REPRESENTATIVE KC



STABILIZED WATER LEVEL 3.45
BELOW DATUM.

TOTAL MONITORING POINT DEPTH 6.95
BELOW DATUM.

MONITORING POINT INSTALLATION RECORD

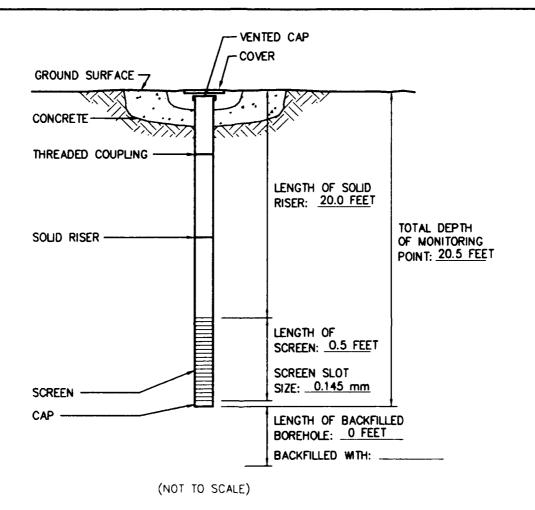
Site 57 Intrinsic Remediation TS MacDill Air Force Base, Florida

PARSONS
ENGINEERING SCIENCE, INC.

Denver, Colorado

1 4502' DRAWINGS' WELLINST SITE 57 75MP1S ON 4/24/95 AT 1400

MONITORING POINT INSTALLATION RECORD JOB NAME MACDILL AIR FORCE BASE MONITORING POINT NUMBER 75MP-1D JOB NUMBER 722450.21 INSTALLATION DATE 3/11/95 LOCATION SITE 57 DATUM ELEVATION 9.165 FEET ABOVE MSL WELL CASING ELEVATION TUBE WELL POINT DATUM FOR WATER LEVEL MEASUREMENT GROUND SURFACE SCREEN DIAMETER & MATERIAL 0.375 STAINLESS STEEL SLOT SIZE 0.145 mm RISER DIAMETER & MATERIAL 0.375 INCH TEFLON TUBING BOREHOLE DIAMETER 1 INCH GEOPROBE CONTRACTOR PARSONS ENGINEERING SCIENCE ES REPRESENTATIVE KC



NO WATER LEVEL MEASUREMENTS TAKEN.

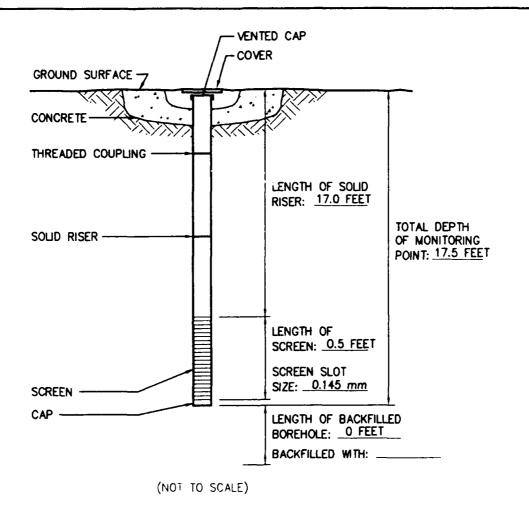
MONITORING POINT INSTALLATION RECORD

Site 57
Intrinsic Remediation TS
MacDill Air Force Base, Florid.

PARSONS ENGINEERING SCIENCE, INI Denver, Colorado

M \45021 DPAWNGS WELLINST SITE 57 75MP1D ON 4/24/95 AT 1500

MONITORING POINT INSTALLATION RECORD JOB NAME MACDILL AIR FORCE BASE MONITORING POINT NUMBER 75MP-3D JOB NUMBER 722450.21 INSTALLATION DATE 3/14/95 LOCATION SITE 57 DATUM ELEVATION 9.278 FEET ABOVE MSL WELL CASING ELEVATION TUBE WELL POINT DATUM FOR WATER LEVEL MEASUREMENT GROUND SURFACE SCREEN DIAMETER & MATERIAL 0.375 STAINLESS STEEL SLOT SIZE 0.145 mm RISER DIAMETER & MATERIAL 0.375 INCH TEFLON TUBING BOREHOLE DIAMETER 1 INCH GEOPROBE CONTRACTOR PARSONS ENGINEERING SCIENCE ES REPRESENTATIVE KC



NO WATER LEVEL MEASUREMENTS TAKEN.

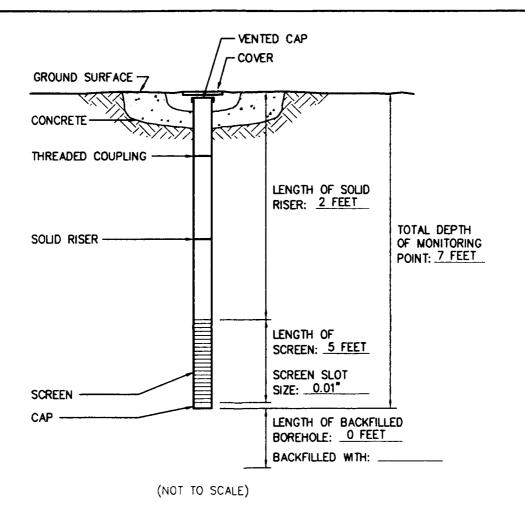
MONITORING POINT INSTALLATION RECORD

Site 57
Intrinsic Remediation TS
MacDill Air Force Base, Florida



Denver, Colorado

MONITORING POINT INSTALLATION RECORD JOB NAME MACDILL AIR FORCE BASE MONITORING POINT NUMBER 75MP-4S JOB NUMBER 722450.21 INSTALLATION DATE 3/14/95 LOCATION SITE 57 DATUM ELEVATION 9.095 FEET ABOVE MSL WELL CASING ELEVATION 8.968 FT AMC' DATUM FOR WATER LEVEL MEASUREMENT GROUND SURFACE SCREEN DIAMETER & MATERIAL 1.0 INCH PVC SLOT SIZE 0.01 INCH RISER DIAMETER & MATERIAL 1.0 INCH PVC BOREHOLE DIAMETER 2 INCHES GEOPROBE CONTRACTOR PARSONS ENGINEERING SCIENCE ES REPRESENTATIVE KC



STABILIZED WATER LEVEL 3.32 FEET BELOW DATUM.

TOTAL MONITORING POINT DEPTH FEET BELOW DATUM.

MONITORING POINT INSTALLATION RECORD

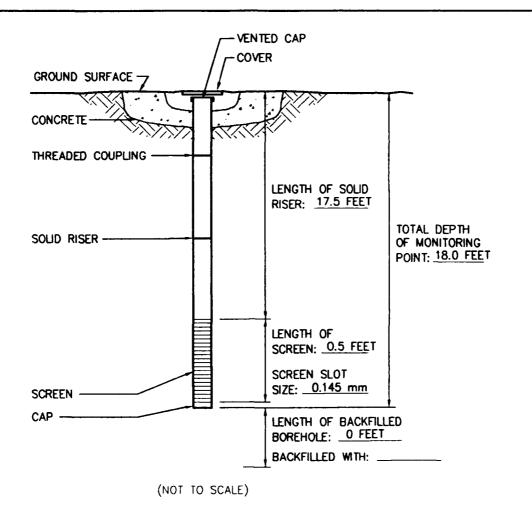
Site 57
Intrinsic Remediation TS
MacDill Air Force Base, Florid

PARSONS ENGINEERING SCIENCE, INC.

Denver. Colorado

MONITORING POINT INSTALLATION RECORD JOB NAME MACDILL AIR FORCE BASE MONITORING POINT NUMBER 75MP-5D JOB NUMBER 722450.21 INSTALLATION DATE 3/14/95 LOCATION SITE 57 DATUM ELEVATION 9.085 FEET ABOVE MSL WELL CASING ELEVATION TUBE WELL POINT DATUM FOR WATER LEVEL MEASUREMENT GROUND SURFACE SCREEN DIAMETER & MATERIAL 0.375 STAINLESS STEEL SLOT SIZE 0.145 mm RISER DIAMETER & MATERIAL 0.375 INCH TEFLON TUBING BOREHOLE DIAMETER 1 INCH

GEOPROBE CONTRACTOR PARSONS ENGINEERING SCIENCE ES REPRESENTATIVE KC



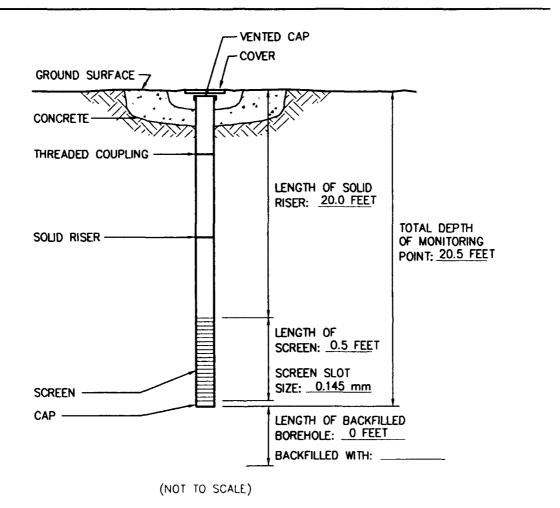
NO WATER LEVEL MEASUREMENTS TAKEN.

MONITORING POINT INSTALLATION RECORD

Site 57 Intrinsic Remediation TS MacDill Air Force Base, Florida



MONITORING POINT INSTALLATION RECORD JOB NAME MACDILL AIR FORCE BASE MONITORING POINT NUMBER 75MP-6D JOB NUMBER 722450.21 INSTALLATION DATE 3/14/95 LOCATION SITE 57 DATUM ELEVATION 8.375 FEET ABOVE MSL WELL CASING ELEVATION TUBE WELL POINT DATUM FOR WATER LEVEL MEASUREMENT GROUND SURFACE SCREEN DIAMETER & MATERIAL 0.375 STAINLESS STEEL SLOT SIZE 0.145 mm RISER DIAMETER & MATERIAL 0.375 INCH TEFLON TUBING BOREHOLE DIAMETER 1 INCH GEOPROBE CONTRACTOR PARSONS ENGINEERING SCIENCE ES REPRESENTATIVE KC



NO WATER LEVEL MEASUREMENTS TAKEN.

MONITORING POINT INSTALLATION RECORD

Site 57 Intrinsic Remediation TS MacDill Air Force Base, Floric

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Denver, Colorado

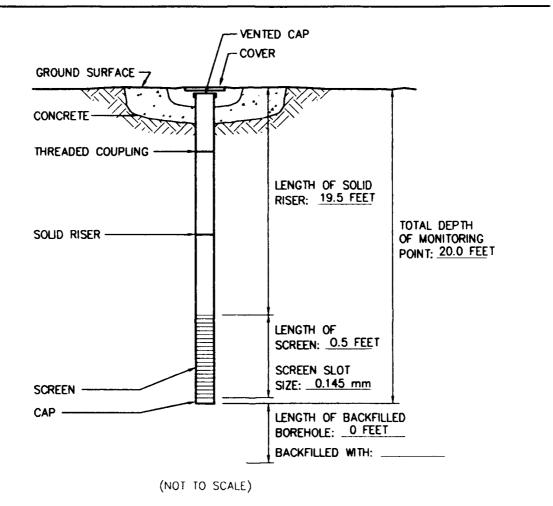
MONITORING POINT INSTALLATION RECORD JOB NAME MACDILL AIR FORCE BASE MONITORING POINT NUMBER 75MP-7S JOB NUMBER 722450.21 INSTALLATION DATE 3/15/95 LOCATION SITE 57 __ WELL CASING ELEVATION ______9.501 FT AMSL DATUM ELEVATION 9.845 FEET ABOVE MSL DATUM FOR WATER LEVEL MEASUREMENT GROUND SURFACE SLOT SIZE 0.01 INCH SCREEN DIAMETER & MATERIAL 0.5 INCH PVC RISER DIAMETER & MATERIAL 0.5 INCH PVC BOREHOLE DIAMETER 2 INCHES GEOPROBE CONTRACTOR PARSONS ENGINEERING SCIENCE ES REPRESENTATIVE KC - VENTED CAP COVER GROUND SURFACE -CONCRETE THREADED COUPLING LENGTH OF SOLID RISER: 2 FEET TOTAL DEPTH SOUD RISER -OF MONITORING POINT: 7 FEET LENGTH OF SCREEN: 5 FEET SCREEN SLOT SIZE: 0.01" SCREEN -CAP -LENGTH OF BACKFILLED BOREHOLE: 0 FEET BACKFILLED WITH: _____ (NOT TO SCALE) MONITORING POINT INSTALLATION RECORD STABILIZED WATER LEVEL 4.55 BELOW DATUM. Site 57 Intrinsic Remediation TS TOTAL MONITORING POINT DEPTH 6.98 FEET MacDill Air Force Base, Florida BELOW DATUM.

PARSONS

ENGINEERING SCIENCE, INC.

Denver, Colorado

MONITORING POINT INSTALLATION RECORD JOB NAME MACDILL AIR FORCE BASE MONITORING POINT NUMBER 75MP-7D JOB NUMBER 722450.21 INSTALLATION DATE 3/14/95 LOCATION SITE 57 DATUM ELEVATION 9.845 FEET ABOVE MSL WELL CASING ELEVATION TUBE WELL POINT DATUM FOR WATER LEVEL MEASUREMENT GROUND SURFACE SCREEN DIAMETER & MATERIAL 0.375 STAINLESS STEEL SLOT SIZE 0.145 mm RISER DIAMETER & MATERIAL 0.375 INCH TEFLON TUBING BOREHOLE DIAMETER 1 INCH GEOPROBE CONTRACTOR PARSONS ENGINEERING SCIENCE ES REPRESENTATIVE KC



NO WATER LEVEL MEASUREMENTS TAKEN.

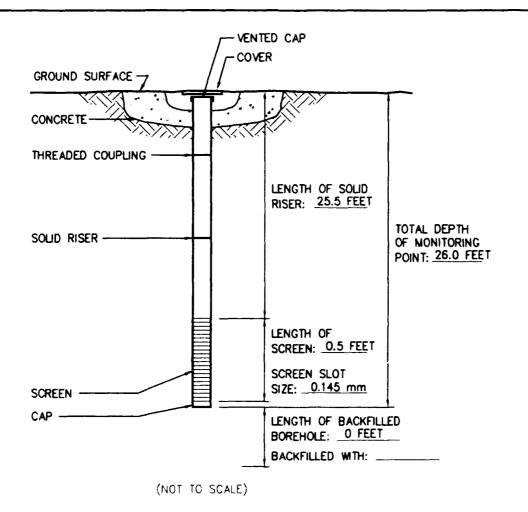
MONITORING POINT INSTALLATION RECORD

Site 57
Intrinsic Remediation TS
MacDill Air Force Base, Floric

PARSONS ENGINEERING SCIENCE, INI

Denver, Colorado

MONITORING POINT INSTALLATION RECORD JOB NAME MACDILL AIR FORCE BASE MONITORING POINT NUMBER 75MP-8D JOB NUMBER 722450.21 INSTALLATION DATE 3/15/95 LOCATION SITE 57 DATUM ELEVATION 9.418 FEET ABOVE MSL WELL CASING ELEVATION TUBE WELL POINT DATUM FOR WATER LEVEL MEASUREMENT GROUND SURFACE SCREEN DIAMETER & MATERIAL 0.375 STAINLESS STEEL SLOT SIZE 0.145 mm RISER DIAMETER & MATERIAL 0.375 INCH TEFLON TUBING BOREHOLE DIAMETER 1 INCH GEOPROBE CONTRACTOR PARSONS ENGINEERING SCIENCE ES REPRESENTATIVE KC



NO WATER LEVEL MEASUREMENTS TAKEN.

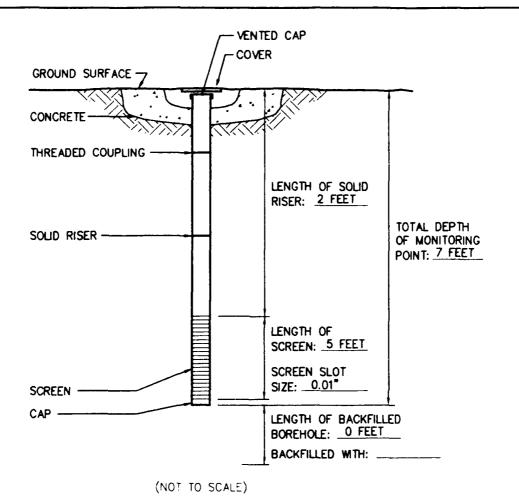
MONITORING POINT INSTALLATION RECORD

Site 57
Intrinsic Remediation TS
MacDill Air Force Base, Florida

PARSONS ENGINEERING SCIENCE, INC

4502' DRAWINGS WELLINST SITEST 75MP80 ON 4/24/95 AT 1500

MONITORING POINT INSTALLATION RECORD JOB NAME MACDILL AIR FORCE BASE MONITORING POINT NUMBER 75MP-9S JOB NUMBER 722450.21 INSTALLATION DATE 3/15/95 LOCATION SITE 57 DATUM ELEVATION 9.651 FEET ABOVE MSL WELL CASING ELEVATION 9.355 FT AM DATUM FOR WATER LEVEL MEASUREMENT GROUND SURFACE SCREEN DIAMETER & MATERIAL 0.5 INCH PVC SLOT SIZE 0.01 INCH RISER DIAMETER & MATERIAL 0.5 INCH PVC BOREHOLE DIAMETER 2 INCHES GEOPROBE CONTRACTOR PARSONS ENGINEERING SCIENCE ES REPRESENTATIVE KC



STABILIZED WATER LEVEL 4.20 FEET BELOW DATUM.

TOTAL MONITORING POINT DEPTH 6.52 FEET BELOW DATUM.

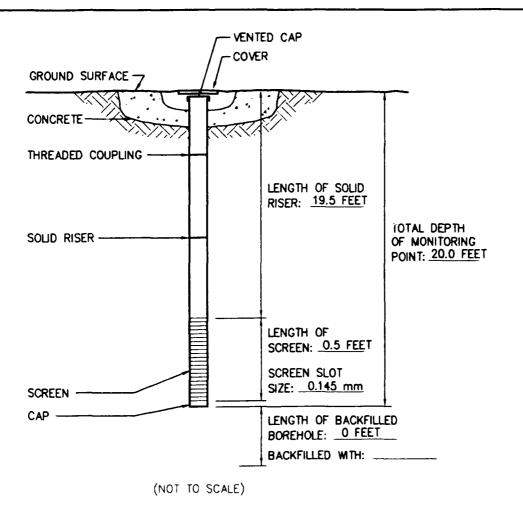
MONITORING POINT INSTALLATION RECORD

Site 57 Intrinsic Remediation TS MacDill Air Force Base, Floric



Denver, Colorado

MONITORING POINT INSTALLATION RECORD JOB NAME MACDILL AIR FORCE BASE MONITORING POINT NUMBER 75MP-9D JOB NUMBER 722450.21 INSTALLATION DATE 3/15/95 LOCATION SITE 57 DATUM ELEVATION 9.651 FEET ABOVE MSL WELL CASING ELEVATION TUBE WELL POINT DATUM FOR WATER LEVEL MEASUREMENT GROUND SURFACE SCREEN DIAMETER & MATERIAL 0.375 STAINLESS STEEL SLOT SIZE 0.145 mm RISER DIAMETER & MATERIAL 0.375 INCH TEFLON TUBING BOREHOLE DIAMETER 1 INCH GEOPROBE CONTRACTOR PARSONS ENGINEERING SCIENCE ES REPRESENTATIVE KC



NO WATER LEVEL MEASUREMENTS TAKEN.

MONITORING POINT INSTALLATION RECORD

Site 57
Intrinsic Remediation TS
MacDill Air Force Base, Florida

PARSONS ENGINEERING SCIENCE, INC

Denver Colorado

MONITOR	RING POINT DEVELOPMENT RECORD Page of _!
Job Number: 722450.21 Location Pumphouse 75 Well Number 75 MP - 15	Job Name: MacDill AFB By KC /MV / 3
Pre-Development Information	Time (Start): 17:15
Water Level: 3 97	Total Depth of Well:
Water Characteristics	
Color which Odor: None Any Films or Immi pH_ Specific Conducta	/ Weak Moderate Strong iscible Material Temperature(OFOC)
Interim Water Characteristics	
Gallons Removed	
рН	
Temperature (^O F ^O C)	
Specific Conductance(μS/	'cm)
Post-Development Information	Time (Finish): ノフ:Чо
Water Level: 3,95	Total Depth of Well:
Approximate Volume Rem	noved: 2 gallons
Water Characteristics	
Color <u>C/so</u> Odor: None Any Films or Imm pH Specific Conducta	Weak Moderate Strong
Comments: Monitoring Point Type Shallow / D	Deen.
moning to one Type Grandwite	

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	MONITORING	POINT DEVELO	PMENT RE	CORD	Page_ <u>/</u> of <u>/</u> _
Job Number:	722450.21 mphouse 75	Job Name:	_MacDill AFB	Date	3115/95
	75 mP-10	Measureme	ent Datum_TO		
Pre-Developm	ent Information	Tin	ne (Start): /6;6	9 0	
Water	Level:		Total Dep	oth of Well:	
Water	Characteristics				
	Color M/ky white Odor: None Any Films or Immiscible IpH 4.57 Specific Conductance(µS	Material Temperature(⁰ F_0	derate S	Strong ————————————————————————————————————	
Interim Water	Characteristics				
Gallor	s Removed				
pН					
Temp	erature (^O F ^O C)				
Specif	fic Conductance(μS/cm)				
Post-Developr	ment Information	Tir	ne (Finish):		
Water	Level:		Total Dep	oth of Well:	
Appro	ximate Volume Removed:				
Water	Characteristics				
	Any Films or Immiscible	Material_ Temperature(OFO	· · · · · · · · · · · · · · · · · · ·	Strong	
	oder is sufferous	÷			

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MONITORING POINT DEVELOPMENT RECOR	RD Page_ <i>i</i> of_/
Job Number: 722450.21 Job Name: MacDill AFB Location Pumphouse 75 By KC /MV / J デ Well Number マラ Measurement Datum TOC	Date <u>3 //7/9</u> 5
Pre-Development Information Time (Start): 1/55	
Water Level: 3 - 5 6 Total Depth of V	Well:
Water Characteristics	
Color Muldy Sandy Clear Cloudy Odor: None Weak Moderate Strong Any Films or Immiscible Material Sluce pH 6.33 Temperature (°F (°C)) 23.5 Specific Conductance (µS/cm) 24x/0	>
Interim Water Characteristics	
Gallons Removed ≈ 3 gal	
рН	
Temperature (^O F ^O C)	
Specific Conductance(µS/cm)	
Post-Development Information Time (Finish): /23	o
Water Level: 3.06 Total Depth of	Well:
Approximate Volume Removed:	
Water Characteristics	
Color Cloudy Odor: None Weak Moderate Strong Any Films or Immiscible Material pH 33	>
Comments: Monitoring Point Type Shallow / Deep	
c Vorms\develop doc pro hit 72.5 ppm	

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Page / of / Job Number: __722450.21 Job Name: MacDill AFB Location Pumphouse 75 Date 3//6 By KC/MV Well Number 75MP-3D Measurement Datum TOC **Pre-Development Information** Time (Start): 10:00 Water Level: Total Depth of Well: Water Characteristics Color candy (sulfurous) Odor: None Strong Moderate) Any Films or Immiscible Material Temperature(°F°C) pH<u>4.64</u> Specific Conductance(µS/cm) 6×10 **Interim Water Characteristics** Gallons Removed # 1.5 gul pН Temperature (^OF ^OC) Specific Conductance(µS/cm) Time (Finish): /020 Post-Development Information Water Level: Total Depth of Well: Approximate Volume Removed: Water Characteristics (Clear) Cloudy Color (sulfurou) Odor: None Weak Moderate) Strong Any Films or Immiscible Material PCY Temperature(OF pH 4.74 Specific Conductance(µS/cm) 13 160 6×10 Comments:

MONITORING POINT DEVELOPMENT RECORD

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Monitoring Point Type Shallow / Deep

Page / of / Job Number: <u>722450.21</u> Job Name: <u>MacDill AFB</u> K@/MV/ Date 3/16/95 Location Pumphouse 75 Well Number 75 mp · 45 Measurement Datum_TOC Time (Start): \$ 16:49 **Pre-Development Information** Water Level: 5,0 Total Depth of Well: Water Characteristics Color Brown, Clear Moderate Odor: None Strong Any Films or Immiscible Material pH 6.42 Temperature(OF (C) Specific Conductance(µS/cm) Interim Water Characteristics Gallons Removed -2 gallons pН Temperature (^oF ^oC) Specific Conductance(µS/cm) Post-Development Information Time (Finish): Total Depth of Well: Water Level: Approximate Volume Removed: Water Characteristics Cloudy Sulforic Odor: None Weak Moderate Strong Any Films or Immiscible Material Temperature(°F-CC) Specific Conductance(µS/cm) 70 × 10 Comments: Monitoring Point Type Shallow / Deep

MONITORING POINT DEVELOPMENT RECORD

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MONITORING POINT DEVELOPMENT RECORD Page / of /	
Job Number: <u>722450.21</u>	Job Name: MacDill AFB
Location <u>Pumphouse 75</u> Well Number 75 m P - 5 b	
vveii Nulliber 13/4 V - 3 B	Measurement Datum_TOC
Pre-Development Information	Time (Start): 10:30
Water Level:	Total Depth of Well:
Water Characteristics	
Color <u>tom - Bron</u> Odor: None Any Films or Immiscible pH <u>6 - 06</u> Specific Conductance(µ	Weak Moderate Strong Material Sheep on Work Temperature(°F °C) 23.3 S/cm) 19 × 0
Interim Water Characteristics	
Gallons Removed 2 ~ 9all	ong
рН	
Temperature (^O F ^O C)	
Specific Conductance(µS/cm)	
Post-Development Information	Time (Finish): /O; 5-0
Water Level: N, M. (Not m	Total Depth of Well: ~ m
Approximate Volume Removed:	2 9~11
Water Characteristics	
Color (Lιω Odor: None Any Films or Immiscible pH 6.15 Specific Conductance(μ	Temperature(°FCO) 23.0
Comments:	
Monitoring Point Type Shallow / Deep	

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MONITORING POINT DEVELOPMENT RECORD Page / of /
Job Number:722450.21 Job Name: _MacDill AFB
Location Pumphouse 75 By KC/MV/69 Date 3/19/95
Well Number 75 m P - 60 Meásurement Datum TOC
Pre-Development Information Time (Start): //;oo
Water Level: № m. Total Depth of Well: 🏍
Water Characteristics
Color to Brown Clear Coody Odor: None Weak Moderate Strong Any Films or Immiscible Material not not code pH 5.3 y Temperature(F C 23.3 Specific Conductance(µS/cm) // x/o
Interim Water Characteristics
Gallons Removed
рН
Temperature (^O F ^O C)
Specific Conductance(μS/cm)
Post-Development Information Time (Finish):
Water Level: approx 2 gallons Total Depth of Well:
Approximate Volume Removed:
Water Characteristics
Color Clear Cloudy Odor: None Weak Moderate Strong Any Films or Immiscible Material pH 5;2
Monitoring Point Type Shallow / Deep

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	MONITORING	POINT DEV	ELOPMENT R	ECORD	Page_	_ of
Job Number: _ LocationPum Well Number		By_KC/MV_	me: <u>MacDill AF</u> rement Datum_T(Date		-
<u>Pre-Developme</u> Water L	nt Information evel: WAN		Time (Start): Total De	epth of Well:		
	Characteristics Color <u> </u>	Material_ Temperature(⁰		Strong		
pH Temper	haracteristics Removed	Je				
Approx	ent Information Level: Apera e 2 imate Volume Removed: Characteristics Color Clear Odor: None Any Films or Immiscible pH 6. 7 4 Specific Conductance(p	Weak Material Con Temperature(Clear Cloudy Moderate J J / F C) 2. 2 · 4	epth of Well: Strong		
Comments: Monitoring Poin	Shallow / Deep	010 hit 5	ppm			

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MONITORING P	OINT DEVELOPMENT RECORD Page / of /
Job Number: 722450.21	Job Name: <u>MacDill AFB</u>
	V KC/MV/JF Date 3/17/95
Well Number 75 MP - 7D	Measurement Datum_TOC
Pre-Development Information	Time (Start): 1150
Water Level:	Total Depth of Well:
Water Characteristics	
Color	Clear Cloudy
Odor: None W	/eak Moderate Strong
Any Films or Immiscible Ma	aterialemperature(⁰ F ⁰ C)
pH Τε Specific Conductance(μS/ο	emperature("F""C)
Opcomo conductanos(por	
Interim Water Characteristics	
Gallons Removed	
рН	
Temperature (^O F ^O C)	
Specific Conductance(µS/cm)	
Post-Development Information	Time (Finish):
Water Level:	Total Depth of Well:
Approximate Volume Removed:	
Water Characteristics	
Color	Clear Cloudy
	Veak Moderate Strong
Any Films or Immiscible M	laterial emperature(⁰ F ⁰ C)
pH Te Specific Conductance(μS/	
Openio Solidada (ps.	
Comments:	
Monitoring Point Type Shallow / Deep	
Monitoring Point Type Shallow / Deep	اه
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MONITORING POINT DEVELOPMENT RECORD Page 1 of / Job Number: <u>722450.21</u> Job Name: MacDill AFB Location Pumphouse 75 By KC/MV JF Date_3 Well Number 75MD-8S Measurement Datum TOC Pre-Development Information Time (Start): 14:30 Water Level: 4.89 3.94 Total Depth of Well: Water Characteristics Moddy Color DARK Brown Clear \ Moderate Weak Strong Any Films or Immiscible Material pH_ 7.04 Temperature(OF (C) 23.3 Specific Conductance(µS/cm) 41 × 10 **Interim Water Characteristics** Gallons Removed рΗ Temperature (OF OC) Specific Conductance(µS/cm) Post-Development Information Time (Finish): Q 14:50 Water Level: Total Depth of Well: Approximate Volume Removed: Water Characteristics Color OF THE Cloudy Weak Odor: None Moderate Strong Any Films or Immiscible Material Temperature((C) 6.75 22.1 Specific Conductance(µS/cm) Comments:

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Monitoring Point Type Shallow / Deep

MONITORIN	IG POINT DEVELOPMENT RECORD	Page <u>_/</u> of <u>_</u> /
Job Number: 722450.21 Location Pumphouse 75 Well Number 35 MP - 8D	Job Name: <u>MacDill AFB</u> By KC /MV Date 3, Measurement Datum TOC	116/5
Pre-Development Information	Time (Start): 1125	
Water Level:	Total Depth of Well:	
Water Characteristics		
Color Sandy Odor: (None) Any Films or Immiscib pH 6 - 89 Specific Conductance	Temperature(OF &)3\frac{1}{2}.4	
Interim Water Characteristics		
Gallons Removed		
рН		
Temperature (^o F ^o C)		
Specific Conductance(µS/cm)		
Post-Development Information	Time (Finish): 1307	
Water Level:	Total Depth of Well:	
Approximate Volume Remove	ed:	
Water Characteristics	_	
Color None Any Films or Immiscil pH 7 48 Specific Conductance	Clear Cloudy Weak Moderate Strong ble Material Temperature(°F C) 32 1 e(µS/cm) 2 8 × 0	
Comments:	<u> </u>	
Monitoring Point Type Shallow Deep	p /	
Extrand slow	- draw	

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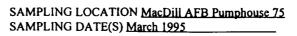
MONITORING POI	NT DEVELOPMENT RECORD Page_
Job Number: 722450.21 Location Pumphouse 75 By Well Number 75 MP - 9S	Job Name: MacDill AFB KC /MV JF Date 3/16/45 Measurement Datum_TOC
Pre-Development Information	Time (Start): /058
Water Level: 4,49'	Total Depth of Well:
Water Characteristics	
Color Muddy Swide Weak Odor: None Weak Anyums or Immiscible Mater pH 1.43 Temp Specific Conductance(µS/cm)	rial cheen (clight) perature(°F °C) 73.8
Interim Water Characteristics	
Gallons Removed ≈ / g. ↓	
рН <i>8.35</i>	
Temperature (OF OC) 23.4	
Specific Conductance(μS/cm) 36χ	10
Post-Development Information	Time (Finish): //20
Water Level: 4, 49	Total Depth of Well:
Approximate Volume Removed:	
Water Characteristics	
ColorOdor: None Weak Any Films or Immiscible Mater pH_ 7, 75 Temp Specific Conductance(µS/cm)	rial

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Monitoring Point Type Shallow / Deep

MONITORING POIN	DEVELOPMENT RECORD Page 7 of 7
Job Number: 722450.21 Location Pumphouse 75 By KC Well Number 75 MP - 9D	Job Name: MacDill AFB C/MV JF Date_3//6/95 Measurement Datum_TOC
Pre-Development Information	Time (Start): /030
Water Level:	Total Depth of Well:
Water Characteristics	
Color Muddy sandy Odor: None Weak Any Films or Immiscible Materia pH 6.88 Temper Specific Conductance(µS/cm)	rature(°F 50) 25.5
Interim Water Characteristics	
Gallons Removed ≈ 1 5 d	
рН	
Temperature (^O F ^O C)	
Specific Conductance(µS/cm)	
Post-Development (information	Time (Finish): 1055
Water Level:	Total Depth of Well:
Approximate Volume Removed:	
Water Characteristics	
Color Odor: None Weak Any Films or Immiscible Materia pH 5-36-5.37 Tempe Specific Conductance(µS/cm)	rature(°F, °C) (1-24-8 25.1
Comments: Monitoring Point Type Shallow Deep	

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GROUND W	ATER SAMPLING RECORD	- MONITORING WELL	-/5
			(number)
REASON FO	R SAMPLING: [\4] Regular S	Sampling; [] Special Sampling;	,
DATE AND	TIME OF SAMPLING: _3//	6/95, 1995 15:30 a.m./p.m E) OF ES Dense	ית
			_
WEATHER:	Party Cloudy	~ ~ 75°F	
DATUM FO	R WATER DEPTH MEASURI	EMENT (Describe): <u>Top of Well Casing</u>	
MONITORIN	IG WELL CONDITION:		
MONITORI	[] LOCKED:	(≯) UNLOCKI	en.
	WELL NUMBER (IS) IS NO		-B
	STEEL CASING CONDITION		
	INNER PVC CASING CON		
		EMENT DATUM (18 - IS NOT) APPAR	RENT
		ECTED BY SAMPLE COLLECTOR	
		REQUIRED REPAIR (describe):	
	[] Montroiding wasa.		
Check-off			
1 [x]	EQUIPMENT CLEANED B	EFORE USE WITH Alconox, Distilled	H2O, and Acetone
. ,		List): All Equipment used in sampling	
2 [x]	PRODUCT DEPTH		FT. BELOW DATUM
	Measured with:	Oil/ Water Interface Probe	
	WATER DEPTH	3.39	PT DELOW DATINA
	WATER DEPTH		FT. BELOW DATUM
	Measured with:	Water Level Probe	
3 [x]	WATER CONDITION REE	ORE WELL EVACUATION (Describe)	
3 (x)		——————————————————————————————————————	
		ts:	
	Outer Committee		
4 [x]	WELL EVACUATION:		
, [v]	Method:		
	Volume Remov	ved:	
	Observations:		Brown neddy
	0000	Water (slightly) very) cloudy Water level (rose - fell - no change)	· · ·
	•	Water level (rose - fell - 10 change) Water odors: Modwate	Sulfuric odor
		Other comments:	

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SAMPL	E EXTRACTION I	METHOD:		
	[] Bailer ma	ade of:		
			p	
	[] Other, de	escribe:		
	Sample obtain	ned is [x] GRAB;	[] COMPOSITE SAMPLE	
ON-SIT	E MEASUREMEN	ITS:		
	Temp: _ てこ	5° C 	Measured with: Orion Instrument	
	pH:	69	Measured with:	
	Conductivity:	28 × 10 HS/cm	Measured with:	
	Dissolved Oxy	ygen: <u>0,15</u>	Measured with: Orion Instrument	
	Redox Potenti	ial:	Measured with:	
	Salinity:		Measured with:	
	Nitrate:		Measured with:	
	Sulfate:		Measured with:	
	Ferrous Iron:		Measured with:	
	2-40 m 2-40 m	L BTEX) L TVH S	ize): 1-250 un presseved Al d Arion preserved	Ika [
	2-40 m	Method	ize): 1-250 un presseved Al Arion preser ocd Containers: Containers: Containers:	
ON-SIT	2-40 m 2-40 m E SAMPLE TREA	Method Method	Containers:	
on-siti	2-40 m 2-40 m E SAMPLE TREA' Filtration:	Method Method added:	Containers: Containers: Containers:	
on-siti	2-40 m 2-40 m E SAMPLE TREA' Filtration:	Method added: METEX TVH TMENT: Method Method Method Method	Containers:	
on-siti	2-40 m 2-40 m E SAMPLE TREA' Filtration:	Method Me	Containers: Containers: Containers: Containers:	
on-siti	2-40 m 2-40 m E SAMPLE TREA' Filtration:	Method Me	Containers: Containers: Containers: Containers: Containers:	
ON-SITI	2-40 m 2-40 m E SAMPLE TREA' Filtration:	Method Me	Containers: Containers: Containers: Containers: Containers: Containers: Containers:	
ON-SITI	2-40 m 2-40 m E SAMPLE TREA Filtration: Preservatives INER HANDLING	Method Me	Containers: Containers: Containers: Containers: Containers: Containers: Containers:	
ON-SITI	E SAMPLE TREATERITERITERITERITERITERITERITERITERITERI	Method Me	Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers:	
ON-SITI	E SAMPLE TREATERITERITERITERITERITERITERITERITERITERI	Method Me	Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers:	

SAMPLING LOCATION <u>MacDill AFB Pumphouse 75</u> SAMPLING DATE(S) <u>March 1995</u>

GROUND W	VATER SAMPLING RECORD - MONITORING WELL 75 MP -	15
REASON FO	DR SAMPLING: M Regular Sampling; [] Special Sampling; TIME OF SAMPLING: 4 4 2 , 19 5 9:50 (m./p.m. DLLECTED BY: MV/KC of ES Denver Samy - 70°	(number)
DATUM FO	R WATER DEPTH MEASUREMENT (Describe): Top of Well Casing	
MONITORI	NG WELL CONDITION:	
	[] LOCKED: ☑ UNLOCKED	
	WELL NUMBER (19 - IS NOT) APPARENT STEEL CASING CONDITION IS: INNER PVC CASING CONDITION IS: New	
	INNER PVC CASING CONDITION IS: New	
	WATER DEPTH MEASUREMENT DATUM (💋 - IS NOT) APPARENT	
	[] DEFICIENCIES CORRECTED BY SAMPLE COLLECTOR [] MONITORING WELL REQUIRED REPAIR (describe):	
	[] MONTORING WEEL REQUIRED RELATIN (describe)	
Check-off 1 [x]	EQUIPMENT CLEANED BEFORE USE WITH Alconox, Distilled H2O, and Items Cleaned (List): All Equipment used in sampling	
2 [x]	PRODUCT DEPTH NP P Measured with: Oil/ Water Interface Probe	FT. BELOW DATUM
	WATER DEPTH 3 5 4 Measured with: Water Level Probe	FT. BELOW DATUM
3 [x]	WATER-CONDITION BEFORE WELL EVACUATION (Describe): Appearance: Odor: Other Comments:	
4 [x]	WELL EVACUATION: Method: Volume Removed: Observations: Water (slightly - very) cloudy Water level (rose - fell - no change) Water odors: Other comments:	

Ground Water	Sampling R	ecord - Monitoring	; Well No.	15	_(Cont'd)
5 [x]	SAMPLE E	XTRACTION ME	THOD:		
		f 1 Bailer made	of:		
			. () () ()	0014000	NATE GALANI E
		Sample obtained	is [x] GRAB; []	COMPOS	BITE SAMPLE
6 {x}	ON-SITE M	IEASUREMENTS			
		Temp: <u>12:8</u>	°C	Measured	with: Orion Instrument
		pH: Broke	27 410 william		l with:
		Conductivity:	27410 William	Measured	l with:
		Dissolved Oxyge	n: 0.18 +21,4	Measured	with: Orion Instrument
		Redox Potential:	+21,4	Measured	l with:
		Salinity:		Measured	l with:
		Nitrate:		Measured	l with:
		Sulfate:		Measured	l with:
		Ferrous Iron:			l with:
		Other:			
7 [] 8 []		ONTAINERS (ma		15 147	ACH GRAB
• []	ON-SITE S	AMPLE IREAIN	ien i :		
	[]	Filtration:	Method		Containers:
	. ,				Containers:
					Containers:
	[]	Preservatives add	led:		
			Method		Containers:
					Containers:
					Containers:
					Containers:
9[]	CONTAINE	ER HANDLING:			
			Sides Labeled Lids Taped		
			Placed in Ice Chest		•
10 (1	OTUED CO	MMENTS.			
10[]	OTHER CC	AVIIVIEN (S		- <u>-</u>	

GROUND WA	ATER SAMPLING RECORD - MONITORING WELL 75 MP - 10	
REASON FOI DATE AND T SAMPLE CO	R SAMPLING: KJ Regular Sampling; [] Special Sampling; FIME OF SAMPLING: 3/16 , 1995 14:40 a.m./pcm LLECTED BY: MV/KC/ TP of ES Beautiful Sampling; Clouder Breezy R WATER DEPTH MEASUREMENT (Describe): Top of Well Casing	(number)
MONITORIN	G WELL CONDITION: [] LOCKED: WELL NUMBER (IS - IS NOT) APPARENT STEEL CASING CONDITION IS: INNER PVC CASING CONDITION IS: WATER DEPTH MEASUREMENT DATUM (IS) [] DEFICIENCIES CORRECTED BY SAMPLE COLLECTOR [] MONITORING WELL REQUIRED REPAIR (describe):	
Check-off [x]	EQUIPMENT CLEANED BEFORE USE WITH Alconox, Distilled H2O, and Items Cleaned (List): All Equipment used in sampling	
2 [x]	PRODUCT DEPTH	_FT. BELOW DATUM
	WATER DEPTH not measured Measured with: Water Level Probe	_FT. BELOW DATUM
3 [x]	WATER-CONDITION BEFORE WELL EVACUATION (Describe): Appearance: Odor: Other Comments:	
4 [x]	WELL EVACUATION: Method: poristaltic pump Volume Removed: 2000 me Observations: Water (slightly - very) cloudy Water level (rose - fell - no change) Water odors: Strong Solkuric of Other comments: Milky whik	dor

Ground Water	r Sampling R	ecord - Monitoring	g Well No75 /	pP-ID (Cont'd)	
5 [x]	SAMPLE E	XTRACTION ME	ETHOD:		
		[x] Pump, type:	Peristaltic Pump	COMPOSITE SAMPLE	
6 [x]	ON-SITE M	Dissolved Oxyge Redox Potential: Salinity: Nitrate: Sulfate: Ferrous Iron:	23 ° _C	Measured with: Orion Instrument Measured with: Measured with: Measured with: Orion Instrument Measured with: Measured with: Measured with: Measured with: Measured with: Measured with: Measured with:	
7[]	SAMPLE C	2- 40 m	aterial, number, size): VORCESECY BTEX TVH	1-250 ml unpres ed Arion preserved	seeved Alkalinity
8[]	ON-SITE S	AMPLE TREATM	IENT:		
	[]	Filtration:	Method	Containers: Containers: Containers:	
	[]	Preservatives add	ded:		
			Method	Containers: Containers: Containers: Containers:	
9[]	CONTAINE	ER HANDLING:			
		[] Container	Sides Labeled Lids Taped s Placed in Ice Chest		
10[]	_	DMMENTS: XD ples take	o vot	Calibrated pH, Do., and	Conductivity

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SAMPLING LOCATION <u>MacDill AFB Pumphouse 75</u> SAMPLING DATE(S) <u>March 1995</u>

GROUND W	ATER SAMPLING RECORD - MONITORING WELL $75MP - 10$	0
		(number)
REASON FO	R SAMPLING: [X Regular Sampling; [] Special Sampling; TIME OF SAMPLING: 7/2 , 1995 0:30 Cm./p.m. OLLECTED BY: MV/KC of ES Den	
DATE AND	TIME OF SAMPLING: 7/2 , 1995	
SAMPLE CO	LLECTED BY: MV/KC of ES Den and	
WEATHER:_	R WATER DEPTH MEASUREMENT (Describe): Top of Well Casing	
DATUM FOR	R WATER DEPTH MEASUREMENT (Describe): Top of Well Casing	
MONITORIX	IG WELL CONDITION:	
MONITORIN	,	
	WELL NUMBER (16) IS NOTE ARRADENT	
	WELL NUMBER (52-15 NOT) APPARENT	
	WELL NUMBER (KS- IS NOT) APPARENT STEEL CASING CONDITION IS: INNER PVC CASING CONDITION IS:	
	WATER DEPTH MEASUREMENT DATUM (IS - IS NOT) APPARENT	
	[] DEFICIENCIES CORRECTED BY SAMPLE COLLECTOR	
	[] MONITORING WELL REQUIRED REPAIR (describe):	
Check-off		
l [x]	EQUIPMENT CLEANED BEFORE USE WITH Alconox, Distilled H2O, and	Acetone
	Items Cleaned (List): All Equipment used in sampling	
	410	
2 [x]		_FT. BELOW DATUM
	Measured with: Oil/ Water Interface Probe	
	WATER DEPTH \(\rho \mathcal{M}\)	_FT. BELOW DATUM
	Measured with: Water Level Probe	_11. BELOW DATOM
	Measured with water bever Frode	
2 ()	WATER-CONDITION BEFORE WELL EVACUATION (Describe):	
3 [x]	WATER-CONDITION BEFORE WELL EVACUATION (DEscribe).	
	Appearance: ne /ky white Odor: noderate sulfer	
	Udor: Mocarate surper	1.6
	Other Comments:	
4 [x]	WELL EVACUATION:	
	Method: peristaltic	
	Volume Removed: 2500 ml	
	Observations: Water (slightly - very) cloudy	
	Water level (rose - fell - no change)	
	Water odors: <u>moderate</u>	
	Other comments:	

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SAMPLE	EXTRACTION M	METHOD:	
	[] Bailer mad	de of:	
	[] Other, des	cribe:	
	Sample obtaine	ed is [x] GRAB; []	COMPOSITE SAMPLE
ONLSITE	MEASUREMENT	re.	
ON-SITE	Temp: 23		Measured with: Orion Instrument
	nH A	oke	Measured with:
	Conductivity:	9 x 10 ps/cm	
	Dissolved Oxy	gen: 0.15 mg/	Measured with: Orion Instrument
	Redox Potentia	11: -29.2 ml	Measured with:
	Salinity:		Measured with:
	Nitrate:		Measured with:
	Sulfate:		Measured with:
	Ferrous Iron: _		Measured with:
	Other:		
			: 1- Itacu
	SAMPLE TREAT		
ON-SITE	SAMPLE TREAT	Method	Containers:
		Method	Containers:Containers:
[]	Filtration:	Method Method Method	Containers:
		Method Method Method dded:	Containers: Containers: Containers:
[]	Filtration:	Method Method Method dded:	Containers: Containers: Containers:
[]	Filtration:	Method Method Method dded: Method Method	Containers: Containers: Containers: Containers: Containers:
[]	Filtration:	Method Method dded: Method Method Method	Containers: Containers: Containers: Containers: Containers: Containers:
[]	Filtration:	Method Method dded: Method Method Method	Containers: Containers: Containers: Containers: Containers:
[]	Filtration:	Method Method dded: Method Method Method Method Method	Containers: Containers: Containers: Containers: Containers: Containers:
[]	Filtration: Preservatives a	Method Method dded: Method Method Method Method Method	Containers: Containers: Containers: Containers: Containers: Containers:
[]	Filtration: Preservatives a NER HANDLING:	Method	Containers: Containers: Containers: Containers: Containers: Containers:
[]	Filtration: Preservatives a NER HANDLING: [] Containe [] Containe	Method Method dded: Method Method Method Method Method Method Method Method Method	Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers:
[]	Filtration: Preservatives a NER HANDLING: [] Containe [] Containe [] Containe	Method Method dded: Method Method Method Method Method for Sides Labeled er Lids Taped	Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers:

SAMPLING LOCATION <u>MacDill AFB Pumphouse 75</u> SAMPLING DATE(S) <u>March 1995</u>

GROUND	WATER SAMPLING RECORD - MONITORING WELL 75 MP - 2	Ś
REASON I DATE AN SAMPLE O WEATHEI	FOR SAMPLING: A Regular Sampling; [] Special Sampling; D TIME OF SAMPLING: 3/3/, 1995 6:50 a.m./p.m. COLLECTED BY: MY/KC of ES Denote R: 5 - 700	(number)
DATUM F	OR WATER DEPTH MEASUREMENT (Describe): Top of Well Casing	···
MONITOR	UNG WELL CONDITION: [] LOCKED: [] LOCKED: [] LOCKED	
	WELL NUMBER (25 - IS NOT) APPARENT	
	STEEL CASING CONDITION IS: New	
	INNER PVC CASING CONDITION IS:	
	WATER DEPTH MEASUREMENT DATUM (IS NOT) APPARENT	
	[] DEFICIENCIES CORRECTED BY SAMPLE COLLECTOR	
	[] MONITORING WELL REQUIRED REPAIR (describe):	
Charle off		
Check-off 1 [x]	EQUIPMENT CLEANED BEFORE USE WITH Alconox, Distilled H2O, a	nd Acetone
۱ [۸]	Items Cleaned (List): All Equipment used in sampling	
2 [x]	PRODUCT DEPTH NO	FT. BELOW DATUM
- []	Measured with: Oil/ Water Interface Probe	
	WATER DEPTH 3.06	FT. BELOW DATUM
	Measured with: Water Level Probe	T.BELOW DATOM
3 [x]	WATER-CONDITION BEFORE WELL EVACUATION (Describe):	
2 [11]	Appearance: Clear / 4e/lon	
	Odor: Strong H.c	
	Other Comments:	
4 [x]	WELL EVACUATION:	
	Method: peristaltic	
	Volume Removed: 2500 ml	·····
	Observations: Water (slightly - very) cloudy	
	Water level (rose - fell - no change) Water odors: على المراحة المراح	
	Other comments:	

d Wat	er Sampling I	Record - Monitorin	g Well No	25	_(Cont'd)
	SAMPLE	EXTRACTION M	ETHOD:		
		[] Bailer made	e of:		
		[x] Pump, type	: Peristaltic Pump		
		Sample obtained	is [x] GRAB; []	COMPOS	SITE SAMPLE
	ON-SITE I	MEASUREMENT	S·	**	
	on one.	Temp:		Measured	d with: Orion Instrument
		pH:			
		Conductivity:	uslan	Measured	d with:
		Dissolved Oxyg	en: mill	Measured	d with: Orion Instrument
		Redox Potential	:	Measured	d with:
		Salinity:			1 with:
		Nitrate:		Measured	1 with:
		Sulfate:		Measured	d with:
		Ferrous Iron:			d with:
		Other:			
	ON-SITE	SAMPLE TREATI	MENT:		
	[]	Filtration:	Method		Containers:
	. ,				Containers:
					Containers:
	[]	Preservatives ad	lded:		
			Method		Containers:
					Containers:
					Containers:
			Method		Containers:
	CONTAIN	NER HANDLING:			
		1 2 2	. Class Fig. 1. 1. 1.		
			r Sides Labeled		
			r Lids Taped		
		Containe	rs Placed in Ice Chest		
	OTHER C	OMMENTS:			

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GROUND V	WATER SAMPLING RECORD - MONITORING WELL $\frac{15 m \rho}{}$	3D HACH Du
		(number)
REASON F	OR SAMPLING: [] Regular Sampling; [] Special Sampling;	
DATE AND	O TIME OF SAMPLING: $\frac{9/2}{2}$, 1995 /2:00 a.m./pm.	
WEATHER		
DATUM FO	OR WATER DEPTH MEASUREMENT (Describe): Top of Well Casing	
MONITORI	ING WELL CONDITION:	
	[] LOCKED: MUNLOCKED	
	WELL NUMBER (K) - IS NOT) APPARENT	
	STEEL CASING CONDITION IS: & New	
	INNER PVC CASING CONDITION IS: New	
	WATER DEPTH MEASUREMENT DATUM (IS - IS NOT) APPARENT	
	[] DEFICIENCIES CORRECTED BY SAMPLE COLLECTOR	
	[] MONITORING WELL REQUIRED REPAIR (describe):	*************************************
		
Check-off		
1 [x]	EQUIPMENT CLEANED BEFORE USE WITH Alconox, Distilled H2O, a	nd Acetone
. [~]	Items Cleaned (List): All Equipment used in sampling	
2 [x]		FT. BELOW DATUM
	Measured with: Oil/ Water Interface Probe	
	WATER DEPTH NM	ET DELOW DATENA
	WATER DELTH	FT. BELOW DATUM
	Measured with: Water Level Probe	
3 [x]	WATER-CONDITION BEFORE WELL EVACUATION (Describe):	
J [A]	Annearance: Muller in Jork (Beschoe).	
	Appearance: mlky white Odor: none	
	Other Comments:	
4 [x]	WELL EVACUATION:	
		· · · · · · · · · · · · · · · · · · ·
	Volume Removed: 2500	
	Observations: Water (slightly - very) cloudy	
	Water level (rose - fell - no change)	
	Water odors: 1 vne	
	Other comments:	

SAM	PLE EXTRACTION I	METHOD:		
	[] Bailer ma	ade of:		
	[x] Pump, ty	pe: Peristaltic Pump		
	[] Other, de		·- <u>-</u>	
	Sample obtain	ned is [x] GRAB; [] C	COMPOSITE SAMPLE	
ON-S	SITE MEASUREMEN	ITS:		
	Temp: ~		Measured with: Orion Instrument	
	nH·	Rake N	Measured with:	
	Conductivity:	5 x us/cm 1	Measured with: Measured with: Orion Instrument Measured with:	
	Dissolved Ox	ygen: 0,15 mg/ 1	Measured with: Orion Instrument	
	Redox I otent	iuii	reasured with:	
	Salinity:	N	Measured with:	
	Nitrate:		Measured with:	
	Sulfate:	N	Measured with:	
			Measured with:	
	Other:			
SAM	PLE CONTAINERS (2 · B TE	material, number, size): 1 y , UOC , TUH	-Anion, MeTHANE , HACE	
	PLE CONTAINERS (2 - B TE SITE SAMPLE TREA		-Anion, MeTHANE, 14ACE	
		TMENT:	Containers:	
ON-S	GITE SAMPLE TREA	TMENT: Method Method	Containers:Containers:	
ON-S	GITE SAMPLE TREA	TMENT: Method Method	Containers:	
ON-S	GITE SAMPLE TREA	TMENT: Method Method Method	Containers:Containers:	
ON-:	SITE SAMPLE TREA Filtration:	TMENT: Method Method Method Method	Containers: Containers: Containers:	
ON-:	SITE SAMPLE TREA Filtration:	TMENT: Method Method Method added: Method	Containers: Containers: Containers: Containers:	
ON-:	SITE SAMPLE TREA Filtration:	TMENT: Method Method Method added: Method Method	Containers: Containers: Containers:	
ON-:	SITE SAMPLE TREA Filtration:	TMENT: Method Method Method added: Method Method Method Method Method	Containers: Containers: Containers: Containers: Containers:	
ON-S	SITE SAMPLE TREA Filtration:	TMENT: Method Method Method added: Method Method Method Method Method Method Method	Containers: Containers: Containers: Containers: Containers: Containers:	
ON-S	Filtration: Preservatives TAINER HANDLING	TMENT: Method Method added: Method Method Method Method Method Method S:	Containers: Containers: Containers: Containers: Containers: Containers:	
ON-S	Filtration: Preservatives TAINER HANDLING	TMENT: Method	Containers: Containers: Containers: Containers: Containers: Containers:	
ON-S	Filtration: Preservatives TAINER HANDLING [] Contain [] Contain	TMENT: Method Method added: Method Method Method Method Method Method S:	Containers: Containers: Containers: Containers: Containers: Containers:	
ON-9	Filtration: Preservatives TAINER HANDLING [] Contain [] Contain	Method	Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers:	
ON-9	Filtration: Preservatives TAINER HANDLING [] Contain [] Contain	Method	Containers: Containers: Containers: Containers: Containers: Containers:	

GROUND W	ATER SAMPLING RECORD - MONITORING WELL # 75 MP_	4 5 S
DATE AND T SAMPLE CO WEATHER:_	R SAMPLING: N Regular Sampling; [] Special Sampling; IME OF SAMPLING: 3/3(, 1995 / 3.00) (100) LLECTED BY: MV/KC of ES per constant of the sampling; R WATER DEPTH MEASUREMENT (Describe): Top of Well Casing	(number)
MONITORIN	IG WELL CONDITION: [] LOCKED: WELL NUMBER (⑤) IS NOT) APPARENT STEEL CASING CONDITION IS: INNER PVC CASING CONDITION IS: WATER DEPTH MEASUREMENT DATUM (IS - IS NOT) APPARENT [] DEFICIENCIES CORRECTED BY SAMPLE COLLECTOR [] MONITORING WELL REQUIRED REPAIR (describe):	
Check-off [x]	EQUIPMENT CLEANED BEFORE USE WITH Alconox, Distilled H2O, and Items Cleaned (List): All Equipment used in sampling	
2 [x]	PRODUCT DEPTH	_FT. BELOW DATUM
	WATER DEPTH	_FT. BELOW DATUM
3 [x]	WATER-CONDITION BEFORE WELL EVACUATION (Describe): Appearance: Odor: Other Comments:	<u>c</u>
4 [x]	WELL EVACUATION: Method: Volume Removed: Observations: Water (slightly - very) cloudy Water level (rose - fell - no change) Water odors: Other comments: Other comments: Tilm Pros Sent	

	iter Samplin	g Record - Monitor	ring Well No	U (Cont'd)
	SAMPL	E EXTRACTION I	METHOD:	
		[] Bailer ma	ade of:	
		[x] Pump, ty	pe: Peristaltic Pump	
		[] Other, de	scribe:	
		Sample obtain	ned is [x] GRAB; [] COMPOSITE SAMPLE
	ON-SIT	E MEASUREMEN	ITS:	
		Temp: 23	<u>ч</u> ° _с	Measured with: Orion Instrument
		II. C		Measured with:
		Conductivity:	55 x 10 M3/	Measured with:
		Dissolved Ox	ygen: 0.08 mg	Measured with: Orion Instrument
		Redox Potent	ial:	Measured with:
		Salinity:	<u> </u>	Measured with:
		Nitrate:		Measured with:
		Sulfate:		Measured with:
		Ferrous Iron:		Measured with:
		Otner:		
	SAMPL	E CONTAINERS ((material, number, size	JUH HACH, ANIONS
	ON-SIT	E SAMPLE TREA	TMENT:	
	[]	Filtration:	Method	Containers:
	()	i muunon.		Containers:
				Containers:
	[]	Preservatives	added:	
			Method	Containers:
			-	
			Method	Containers:
				Containers:
İ	CONTA	INER HANDLING	Method	Containers: Containers: Containers:
İ	CONTA		Method Method G:	Containers:
I	CONTA	Contain	Method Method G: ner Sides Labeled	Containers:
Ì	CONTA	Contain	Method Method G: ner Sides Labeled ner Lids Taped	Containers: Containers:
	CONTA	Contain	Method Method G: ner Sides Labeled	Containers: Containers:
1		Contain	Method Method G: ner Sides Labeled ner Lids Taped	Containers: Containers:

GROUND W	ATER SAMPLING RECORD - MONITORING WELL $\frac{75mp}{}$	-5 D
SAMPLE CO WEATHER:_	R SAMPLING: [Regular Sampling; [] Special Sampling; [] STIME OF SAMPLING: 3/29, 1995 12 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	(number)
MONITORIN	IG WELL CONDITION:	
MOMTOR	[] LOCKED: [/] UNLOCKED	
	WELL NUMBER (IS IS NOT) APPARENT	
	STEEL CASING CONDITION IS: Wew INNER PVC CASING CONDITION IS: Wew	
	WATER DEPTH MEASUREMENT DATUM (IS - IS NOT) APPARENT	
	DEFICIENCIES CORRECTED BY SAMPLE COLLECTOR	
	MONITORING WELL REQUIRED REPAIR (describe):	
Check-off [x]	EQUIPMENT CLEANED BEFORE USE WITH Alconox, Distilled H2O, and Items Cleaned (List): All Equipment used in sampling	
2.5.1	PRODUCT DEPTH WP	FT. BELOW DATUM
2 [x]	PRODUCT DEPTH	FI. BELOW DATOM
	.,,	FT. BELOW DATUM
3 [x]	WATER-CONDITION BEFORE WELL EVACUATION (Describe): Appearance: milky white Odor: maderate Gilfuric Other Comments:	
4 {x}	WELL EVACUATION: Method: Volume Removed: Observations: Water (slightly - very) cloudy Water level (rose - fell - no change) Water odors: Other comments:	

Ground Water	Sampling Re	ecord - Monitoring	g Well No.	50	_(Cont'd)
5 [x]	SAMPLE EX	XTRACTION ME	THOD:		
		[] Bailer made	of:		
		[] Other, descr	ibe:	····	
		Sample obtained	is [x] GRAB; []	COMPOS	SITE SAMPLE
6 [x]	ON-SITE M	EASUREMENTS	3 :		
. ,		Temp: 24.	3° C	Measured	with: Orion Instrument
		pH: 6	41	Measured	l with:
		Conductivity:	20 ×10 µ5/cm	Measured	l with:
		Dissolved Oxyge	en: $0.04 \frac{m_1}{103.2}$	Measured	with: Orion Instrument
		Redox Potential:	-103.2 mV	Measured	with:
		Salinity:	<u></u>	Measured	l with:
		Nitrate:		Measured	l with:
		Sulfate:	<u> </u>	Measured	with:
					l with:
		Other:			
7[]	SAMPLE CO	2- BTex	You, Tu	μ	eth, Anions, Hact
8[]	ON-SITE SA	AMPLE TREATM	IENT:		
	[]	Filtration:	Method		Containers:
	LJ				Containers:
					Containers:
	[]	Preservatives add	ded:		
			Method		Containers:
					Containers:
					Containers:
			Method		Containers:
9[]	CONTAINE	R HANDLING:			
			Sides Labeled		
			Lids Taped		
		Container	s Placed in Ice Chest		
10[]	OTI-ER CO	MMENTS:			
					

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GROUND W	ATER SAMPLING RECORD - MONITORING WELL $75 mP - 6$	ج ک
REASON FO DATE AND SAMPLE CO WEATHER:	OR SAMPLING: A Regular Sampling; [] Special Sampling; TIME OF SAMPLING: 3 24 , 1995 13; 33 a.m./p.m. OLLECTED BY: NV/KC of ES Dever Super Scool R WATER DEPTH MEASUREMENT (Describe): Top of Well Casing	(number)
MONITORIN	WELL CONDITION: [] LOCKED: WELL NUMBER (IS- IS NOT) APPARENT STEEL CASING CONDITION IS: INNER PVC CASING CONDITION IS: WATER DEPTH MEASUREMENT DATUM (IS - IS NOT) APPARENT [] DEFICIENCIES CORRECTED BY SAMPLE COLLECTOR [] MONITORING WELL REQUIRED REPAIR (describe):	
Check-off [x]	EQUIPMENT CLEANED BEFORE USE WITH Alconox, Distilled H2O, an Items Cleaned (List): All Equipment used in sampling	
2 [x]	PRODUCT DEPTH	FT. BELOW DATUM
•	WATER DEPTH \(\rightarrow\mathre{M}\) Measured with: \(\frac{\text{Water Level Probe}}{\text{Vater Level Probe}}\)	FT. BELOW DATUM
3 [x]	WATER-CONDITION BEFORE WELL EVACUATION (Describe): Appearance: Milking while (Odor: Strang Sulfance Other Comments:	
4 [x]	WELL EVACUATION: Method: Volume Removed: Observations: Water (slightly - very) cloudy Water level (rose - fell - no change) Water odors: Other comments:	

d W	ater Sampling	g Record - Monitoring	Well No.	6D	(Cont'd)
	SAMPLI	E EXTRACTION ME	THOD:		
		[] Bailer made	of:		
		[x] Pump, type:_	Peristaltic Pump		
		[] Other, descri	be:		
		Sample obtained i	s [x] GRAB; []	СОМРО	SITE SAMPLE
]	ON-SITI	E MEASUREMENTS:			
ı	011 0111	Temp: 25.1		Measure	d with: Orion Instrument
		pH: <u>5,60</u>		Measure	d with:
		Conductivity: 4	7×10 M5/cm		d with:
			1: 0.14 mg/e		d with: Orion Instrument
		Radov Potential:	- 56.0 MV		ed with:
				Maagura	d with:
		Salinity:		Magazira	d with:
		Nitrate:		Manage	d with:
		Sulfate:	··	Magazire	d with:
		Ferrous Iron:			d with:
	ON-SITI	E SAMPLE TREATM	ENT:		
	[]	Filtration:	Method		Containers:
					Containers:
			Method		Containers:
	[]	Preservatives adde	ed:		
			Method_		Centainers:
					Containers:
					Containers:
					Containers:
	CONTA	INER HANDLING:			
			Sides Labeled		
		[] Container I			
		[] Containers	Placed in Ice Chest		
	OTHER	COMMENTS:			

SAMPLING LOCATION <u>MacDill AFB Pumphouse 75</u> SAMPLING DATE(S) <u>March 1995</u>

GROUND V	WATER SAMPLING RECORD - MONITORING WELL $75mp-7$	5 HACH DUP
		(number)
REASON F	OR SAMPLING: [X Regular Sampling; [] Special Sampling;	
DATE AND	TIME OF SAMPLING: $\frac{4/2}{2}$, 1995 $\frac{14:50}{2}$ a.m./p.m.	
SAMPLE C	OLLECTED BY: MV/KC of ES Denver	
WEATHER	Smay 750	
DATUM FO	OR WATER DEPTH MEASUREMENT (Describe): Top of Well Casing	
MONITORI	ING WELL CONDITION:	
	[] LOCKED: UNLOCKED	
	WELL NUMBER (🔇 - IS NOT) APPARENT	
	STEEL CASING CONDITION IS: New	
	INNER PVC CASING CONDITION IS:	
	WATER DEPTH MEASUREMENT DATUM 💋 - IS NOT) APPARENT	
	[] DEFICIENCIES CORRECTED BY SAMPLE COLLECTOR	
	MONITORING WELL REQUIRED REPAIR (describe):	
Check-off		
1 [x]	EQUIPMENT CLEANED BEFORE USE WITH Alconox, Distilled H2O, and	
	Items Cleaned (List): All Equipment used in sampling	
2 {x}	PRODUCT DEPTH	FT. BELOW DATUM
2 [*]	Measured with: Oil/ Water Interface Probe	1. BELOW DATOM
	Measured with. On/ water interface 1100c	
	WATER DEPTH	FT. BELOW DATUM
	Measured with: Water Level Probe	
	Moderated With Mary Devel 11000	
3 [x]	WATER-CONDITION BEFORE WELL EVACUATION (Describe):	
. ()	Appearance: Cloudy Brown	
	Appearance: Cloudy Brown Odor: noderate U.C.	
	Other Comments:	
4 [x]	WELL EVACUATION:	
• /		<u> </u>
	Volume Removed: 2500 ml	
	Observations: Water (slightly - very) cloudy	
	Water level (rose - fell - no change)	
	Water odors: moder ale	
	Other comments:	
	ONIVE VOIDINGINGS	

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SAMI	LE EXTRACTION M	METHOD:	
	[] Bailer mad	de of:	
	[x] Pump, typ	pe: Peristaltic Pump	
	[] Other, des	scribe:	
	Sample obtained	ed is [x] GRAB; [] COMPOSITE SAMPLE	
ON-S	TE MEASUREMEN	TS:	
• •		° _C _ Measured with: Orion Instrument	
	pH:	By - Ke Measured with:	
	Conductivity:	By ke Measured with: Measured with:	
	Dissolved Oxy	gen: A Measured with: Orion Instrument	
	Redox Potentia	gen:/c Measured with: <u>Orion Instrument</u> al: MV Measured with:	
	Salinity:	Measured with:	
	Nitrate:	Measured with:	
	Sulfota:	Measured with:	
	Sulfate:	Measured with:	
	Other:	ivicasured with.	
	Omer.		
SAMI	PLE CONTAINERS (1 2 - B T e	material, number, size): 1- Methane, Anons Y, JOC, TUH, HACH	
	PLE CONTAINERS (1 2-Bte 		
		TMENT:	
ON-S	ITE SAMPLE TREAT	TMENT:	
ON-S	ITE SAMPLE TREAT	TMENT: Method Containers:	
ON-S	ITE SAMPLE TREAT	TMENT: Method Containers: Method Containers: Method Containers:	
ON-S	TE SAMPLE TREAT	TMENT: Method Containers: Method Containers: Method Containers: added:	
ON-S	TE SAMPLE TREAT	TMENT: Method Containers: Method Containers: Method Containers: added: Method Containers:	
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ON-S	TE SAMPLE TREAT	TMENT: Method Containers: Method Containers: added: Method Containers: Method Containers: Method Containers:	
on-s []	TE SAMPLE TREAT	Method Containers: Method Containers: Method Containers: added: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers:	
on-s []	Filtration: Preservatives a	Method Containers: Method Containers: Method Containers: added: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers:	
on-s []	Filtration: Preservatives a	Method Containers: Method Containers: Method Containers: added: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers:	
on-s []	Filtration: Preservatives a FAINER HANDLING Contain Contain	Method Containers: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers:	
ON-S	Filtration: Preservatives a FAINER HANDLING Contain Contain	Method Containers: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers:	
ON-S	Filtration: Preservatives a FAINER HANDLING Contain Contain	TMENT: Method Containers: Method Containers: Method Containers: added: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers: Method Containers:	

SAMPLING LOCATION MacDill AFB Pumphouse 75
SAMPLING DATE(S) March 1995

GROUND W	ATER SAMPLING RECORD - MONITORING WELL	75 MP - 70
		(number)
REASON FO	OR SAMPLING: M Regular Sampling; [] Special Sampling;	/n m
SAMPLECO	TIME OF SAMPLING: 4/2, 19 95 14/10 a.m. OLLECTED BY: 50/16C of ES Des 20 Suny 75	7p.m.
WEATHER	Sugar 75"	
DATUM FOI	R WATER DEPTH MEASUREMENT (Describe): Top of Well Ca	sing
DATIONITO	WITTER DEI III WENDOREMENT (Describe). Top or won ou	VIII.B
MONITORIN	NG WELL CONDITION:	
	[] LOCKED: [X] UNLO	CKED
	WELL NUMBER (IS)- IS NOT) APPARENT STEEL CASING CONDITION IS: NEW	
	STEEL CASING CONDITION IS: NEW	
	INNER PVC CASING CONDITION IS: New	D + D F3 100
	WATER DEPTH MEASUREMENT DATUM (IS NOT) AP	PARENT
	[] DEFICIENCIES CORRECTED BY SAMPLE COLLECTOR	
	[] MONITORING WELL REQUIRED REPAIR (describe):	
CI 1 CC		
Check-off	COMPAGNIT OF EAVIED DECORE FIGE MILTIN ALTERNATION DISASI	lad UOO and Assess
1 [x]	EQUIPMENT CLEANED BEFORE USE WITH Alconox, Distil	
	Items Cleaned (List): All Equipment used in sampli	ng
2 [x]	PRODUCT DEPTH NP	FT. BELOW DATUM
2 [^]	Measured with: Oil/ Water Interface Probe	11. 2220 27110
	Weasured with. Old Water Interface 11900	
	WATER DEPTH	FT. BELOW DATUM
	Measured with: Water Level Probe	
	Managed Williams	
3 [x]	WATER-CONDITION BEFORE WELL EVACUATION (Description)	ibe):
5 ()	Appearance: Milky while	<u> </u>
	Appearance: Milky while Odor: Moderate Sulf	wic
	Other Comments:	
4 [x]	WELL EVACUATION:	
. ()	Method: peristaltic	
	Volume Removed: 2500 ml	
	Observations: Water (stightly - very) cloudy	
	Water level (rose - fell - no change	ge)
	Water odors: no tera	42
	Other comments:	

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Ground Water	r Sampling Ro	ecord - Monitoring	g Well No.	np-70	(Cont'd)
5 [x]	SAMPLE E	XTRACTION ME	ETHOD:		
		[] Bailer made	of:		
		[x] Pump, type:	Peristaltic Pump		
		[] Other, descr	ibe:		
		Sample obtained	is [x] GRAB; []	COMPOS	ITE SAMPLE
6 [x]	ON-SITE M	IEASUREMENTS	S :		
		Temp: 24.8	°C	Measured	with: Orion Instrument
		pH:	Broke	Measured	with:
		Conductivity: 2	2410 MS/cm	Measured	with:
		Dissolved Oxyge	en: 0.23 mg/e	Measured	with: Orion Instrument
			-43.3 mV	Measured	with:
		Salinity:		Measured	with:
		Nitrate:		Measured	with:
		Suitate:			with:
		Other:			with:
7[]	SAMPLE C	ONTAINERS (ma 2-BTEX	nterial, number, size): Voc , TVH)-HAC	L. Anion, METHANE
8[]	ON-SITE SA	AMPLE TREATM	MENT:		
	[]	Filtration:	Method		Containers:
	l J	i ma atton.			Containers:
					Containers:
	[]	Preservatives add	ded:		
			Method		Containers:
					Containers:
					Containers:
					Containers:
9[]	CONTAINE	ER HANDLING:			
		[[']] Container	Sides Labeled		
			Lids Taped		
			s Placed in Ice Chest		•
10[]	OTHER CO				
					

Puples

		70MD_00	LAB, EPA,
GROUND V	VATER SAMPLING RECORD	- MONITORING WELL 75MP-85	ms/msp's
REASON F	OR SAMPLING: M Regular S.	ampling: [] Special Sampling:	(number)
DATE AND	TIME OF SAMPLING: 3/ 3	ampling; [] Special Sampling;	
SAMPLEC	OLI ECTED BY MULKC	of ES Penus	
WEATHER	: Samy	75-01-01-01-01-01-01-01-01-01-01-01-01-01-	
		MENT (Describe): Top of Well Casing	
MONITOR	NG WELL CONDITION:		
	[] LOCKED:	(✗ UNLOCKED	
	WELL NUMBER 🕰 - IS NO	OT) APPARENT	
	STEEL CASING CONDITIO	NIS: rew	
	INNER PVC CASING COND	DITION IS:	
	WATER DEPTH MEASURE	MENT DATUM (IS NOT) APPARENT	
		CTED BY SAMPLE COLLECTOR	
		EQUIRED REPAIR (describe):	
Check-off			
1 [x]	EQUIDMENT OF EARIED DE	FORE USE WITH Alconox, Distilled H2O, and	1 Acatona
ı (x)		List): All Equipment used in sampling	
	items Cleaned (1	List). All Equipment used in sampling	
2 [x]	PRODUCT DEPTH		FT. BELOW DATUM
	Measured with:	Oil/ Water Interface Probe	
	WATER DEPTH	4 21	FT. BELOW DATUM
			FI. BELOW DATOM
	Measured with:_	Water Level Probe	
3 [x]	WATER-CONDITION BEFO	ORE WELL EVACUATION (Describe):	
- ()	Appearance:	mulber white	
	Odor:	moderate Sulfurge	_
	Other Comments		
	Outer Comment		
4 [x]	WELL EVACUATION:	(1)	
,	Method:	perigtalfic	
	Volume Remove		
	Observations:	Water (skightly - very) cloudy	
		Water level (rose - fell - no change),	
		Water odors: no de ate	
		Other comments:	
		Outer Comments.	

Ground Water	Sampling Re	cord - Monitoring	Well No	8 <u>5</u>	(Cont'd)	
5 [x]	SAMPLE EX	CTRACTION ME	THOD:			
		[] Bailer made	of:			
		[x] Pump, type:	Peristaltic Pump			
		[] Other, descri	ibe:			
		Sample obtained	is [x] GRAB; []	COMPOS	ITE SAMPLE	
6 [x]	ON-SITE MI	EASUREMENTS				
• [A]	00			Measured	with: Orion Instrument	
		pH: > 2	ن ج	Measured	with:	
		Conductivity:	36+10 M5/cm	Measured	with:	
		Dissolved Oxyge	n: 0.18 me/	Measured	with: Orion Instrument	
		Redox Potential:	-3.2 ml	Measured	with:	
		Salinity:			with:	
		Nitrate:		Measured	with:	
		Sulfate:		Measured	with:	
		Ferrous Iron:		Measured	with:	
		Other:				
7[]		4-1 VOC			nions, Toc, AlK,	
		B-BTE)	TVH			
8[]	ON-SITE SA	MPLE TREATM	ENT:			
	[]	Filtration:	Method		Containers:	
	. ,		Method		Containers:	
					Containers:	
	[]	Preservatives add	led:			
			Method		Containers:	
					Containers:	
			Method		Containers:	
			Method		Containers:	
9[]	CONTAINE	R HANDLING:				
	Container Sides Labeled					
		-	Lids Taped			
			Placed in Ice Chest		•	
	4	Containers	riaced in ice chest			
10[]	OTHER CO	MMENTS:				
						
			· · · · · · · · · · · · · · · · · · ·			

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GROUND W	ATER SAMPLING RECORD - MONITORING WELL75 MP-8	30
REASON FO DATE AND T SAMPLE CO WEATHER:_	R SAMPLING: Regular Sampling; [] Special Sampling; [] ME OF SAMPLING: 3/30/ , 19 95 /0:45 @./p.m. LLECTED BY: MM/KC of ES Derver S. WATER DEPTH MEASUREMENT (Describe): Top of Well Casing	(number)
MONITORIN	G WELL CONDITION: [] LOCKED: WELL NUMBER (IS - IS NOT) APPARENT STEEL CASING CONDITION IS: INNER PVC CASING CONDITION IS: WATER DEPTH MEASUREMENT DATUM (IS - IS NOT) APPARENT [] DEFICIENCIES CORRECTED BY SAMPLE COLLECTOR [] MONITORING WELL REQUIRED REPAIR (describe):	
Check-off [x]	EQUIPMENT CLEANED BEFORE USE WITH Alconox, Distilled H2O, Items Cleaned (List): All Equipment used in sampling	
2 [x]	PRODUCT DEPTH	FT. BELOW DATUM
	WATER DEPTH NM Measured with: Water Level Probe	FT. BELOW DATUM
3 [x]	WATER-CONDITION BEFORE WELL EVACUATION (Describe): Appearance: () ear Odor: Sulfuc: c Other Comments:	
4 [x]	WELL EVACUATION: Method: Volume Removed: Volume Removed: Volume Removed: Vater (signily - very) cloudy Water level (rose - fell - no change) Water odors: Other comments:	rone

round Wat	er Sampling	g Record - Monitor	ing Well No.	(Cont'd)	
[x]	SAMPLE	E EXTRACTION N	иетноd:		
		[] Bailer ma	de of:		
		Sample obtain	ed is [x] GRAB; []	COMPOSITE SAMPLE	
[x]	ON-SITE	E MEASUREMEN	TS·		
[^]	0., 0., 1			Measured with: Orion Instrument	
		pH: 7.0	7	Measured with: Orion Instrument Measured with: Measured with:	
		Conductivity:	29+10 us/cm	Measured with:	
		Dissolved Oxy	gen: 2.12 mg/	Measured with: Orion Instrument	
		Redox Potenti	al: -03.7 mV	Measured with: Orion Instrument Measured with:	
		Salinity:		Measured with:	
		Nitrate:		Measured with:	
		Sulfate:		Measured with:	
		Ferrous Iron:		Measured with:	
					
[]	SAMPLE	CONTAINERS (2 - β 7	material, number, size)	1-meth, HACH, Anions	
					
[]	ON-SITE SAMPLE TREATMENT:				
	[]	Filtration:	Method	Containers:	
	()	i maunon.		Containers:	
				Containers:	
	[]	Preservatives :			
	. ,				
				Containers:	
			Method	Containers:	
			Method	Containers:	
			Method	Containers:	
[]	CUNTA	NER HANDLING	i:		
		Contain	er Sides Labeled		
		// 1	er Lids Taped		
			ers Placed in Ice Chest	•	
0[]	ОТЫЕР	COMMENTS:	Slave Die	no rade	
/ L }	OTHER.	20 0	W h. L	Ro Accurate	
		- VV	and the F	us Acces of	
					
					

GROUND V	VATER SAMPLING RECORD - MONITORING WELL 75mp-0	95 HACH OUP
		(number)
REASON FO	OR SAMPLING: A Regular Sampling; [] Special Sampling;	
SAMPLE CO	OTIME OF SAMPLING: 3/30, 1995 12:30 a.m./p.m. OLLECTED BY: MV/KC of ES herry	
	5	
	OR WATER DEPTH MEASUREMENT (Describe): Top of Well Casing	
MONITORI	NG WELL CONDITION:	
WOME	[] LOCKED: MULOCKED	
	WELL NUMBER (48 - IS NOT) APPARENT	
	STEEL CASING CONDITION IS: NEW	
	INNER PVC CASING CONDITION IS:	
	WATER DEPTH MEASUREMENT DATUM (©- IS NOT) APPAREN	1
	[] DEFICIENCIES CORRECTED BY SAMPLE COLLECTOR [] MONITORING WELL REQUIRED REPAIR (describe):	
	[] MONITORING WELL REQUIRED RELIABL (describe).	
Check-off		
1 [x]	EQUIPMENT CLEANED BEFORE USE WITH Alconox, Distilled H2C	
	Items Cleaned (List): All Equipment used in sampling	
2 [x]	PRODUCT DEPTH NP	FT. BELOW DATUM
	Measured with: Oil/ Water Interface Probe	
	WATER DEPTH	FT. BELOW DATUM
	WATER DEPTH	FT. BELOW DATOM
	Measured with. Water Devel 11000	
3 [x]	WATER-CONDITION BEFORE WELL EVACUATION (Describe):	
	Appearance: BROWN Odor:	
		Sulturic
	Other Comments:	
4 [x]	WELL EVACUATION:	
, ()	Method: Peristalic	
	Volume Removed: 2 500	
	Observations: Water (slightly - very) cloudy	
	Water level (rose - fell - no change) Water odors:	. 1.
	Water odors: Moder Other comments: Cleur	- W-1
	Ouici comments. Se w	

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	PLE EXTRACTION !	METHOD:
	[] Bailer ma	nade of:
	[x] Pump. tv	ype: Peristaltic Pump
	[] Other, de	escribe:
	Sample obtain	ned is [x] GRAB; [] COMPOSITE SAMPLE
	Sample obtain	inclis (A) GIAD, [] COMITOSTIL SAMITED
ON-S	ITE MEASUREMEN	
	1 emp. <u>09.</u>	.9 ° C Measured with: Orion Instrument
	pH: 7,0	Measured with:
		: 37×10 as S/cy Measured with:
	Dissolved Oxy	kygen: 6.48 Measured with: Orion Instrument
	Redox Potenti	tial: -6.8 ml Measured with:
	Salinity:	Measured with:
	Nitrate:	Measured with:
	Sulfate:	Measured with:
	Ferrous Iron:	Measured with:
0414	DI E CONTA DIEDO ((material, number, size): 1-meth, Anjon HALL TOO
SAM	PLE CONTAINERS ((material, number, size): 1-meth, Anon HALL TOO
	- L - D-1	1 ex , voc , 7 vr
		Hack Dus
OM	ITE CANADI E TDEA'	Tharbir.
ON-S	ITE SAMPLE TREA	AIMENI:
[]	Filtration:	Method Containers:
		Method Containers:
		WediodContainers
		Method Containers:
		Method Containers:
[]	Preservatives a	
[]	Preservatives a	
[]	Preservatives a	added: Method Containers:
[]	Preservatives a	Method Containers: Method Containers:
[]	Preservatives :	added: Method Containers:
		Method Containers: Method Containers: Method_ Containers: Method_ Containers:
	Preservatives :	Method Containers: Method Containers: Method_ Containers: Method_ Containers:
	TAINER HANDLING	Method Containers: Method Containers: Method Containers: Method_ Containers:
	TAINER HANDLING	Method Containers: Method Containers: Method_ Containers: Method_ Containers:
	TAINER HANDLING [] Contain [] Contain	Method Containers: Method Containers: Method Containers: Method_ Containers:
CON	TAINER HANDLING [] Contain [] Contain [] Contain	Method Containers: Method Containers: Method Containers: Method Containers: G: G: Iner Sides Labeled Iner Lids Taped Iners Placed in Ice Chest
CON	TAINER HANDLING [] Contain [] Contain	Method Containers: Method Containers: Method Containers: Method Containers: G: G: Iner Sides Labeled Iner Lids Taped Iners Placed in Ice Chest
CON	TAINER HANDLING [] Contain [] Contain [] Contain	Method Containers: Method Containers: Method Containers: Method Containers: G: G: Iner Sides Labeled Iner Lids Taped Iners Placed in Ice Chest

		SAMPLING LOCATION SAMPLING DATE(S) M	N MacDill AFB Pumphouse 75 Jarch 1995
GROUND V	VATER SAMPLING RECORD - M	ONITORING WELL 75/119-90	
REASON FOR DATE AND SAMPLE C	OR SAMPLING: M Regular Sam TIME OF SAMPLING: 3/30 OLLECTED BY: MYKC	oling; [] Special Sampling; , 1995a.m./p.m. of ES Denue,	(number)
WEATHER	·		
DATUM FO	OR WATER DEPTH MEASUREME	ENT (Describe): Top of Well Casing	
MONITORI	NG WELL CONDITION:		
MONTOR	[] LOCKED: WELL NUMBER (15) IS NOT) STEEL CASING CONDITION I INNER PVC CASING CONDITI	S:	
Check-off l [x]		RE USE WITH <u>Alconox</u> , <u>Distilled H2O</u> ,): <u>All Equipment used in sampling</u>	
2 [x]	PRODUCT DEPTH	W P Water Interface Probe	FT. BELOW DATUM
	WATER DEPTH		FT. BELOW DATUM
3 [x]	WATER-CONDITION BEFORE Appearance: Lig Odor: Other Comments:	WELL EVACUATION (Describe): At Brown moderate Swlewe	
4 [x]	W .	Vater (slightly - very) cloudy Vater level (rose - fell - no change) Vater odors:	

Other comments:_

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nd Water	Sampling	Record - Monitori	ing Well No	90	(Cont'd)
]	SAMPLE	EXTRACTION N	ИЕТНОD:		
		[] italier ma	de of:		
		[x] Pump, typ	e: Peristaltic Pump		
		Sample obtaine	ed is [x] GRAB; []	COMPOS	SITE SAMPLE
ς}	ON-SITE	MEASUREMEN'	rs.		
- 1			7 .° _C	Measured	with: Orion Instrument
		pH: 5.6	_ ·		with:
		Conductivity:	0 1×10 pic/cm	Measured	with:
		Dissolved Oxy	gen: 0.35 mc/o		with: Orion Instrument
		Redox Potentia	gen: 0.35 my/e al: -1.3 my/e		with:
		Salinity:		Measured	with:
		Nitrate:		Measured	with:
		Sulfate:		Measured	with:
		Ferrous Iron:		Measured	with:
		Other:			
]		SAMPLE TREAT			
	[]	Filtration:			Containers:
					Containers:
			Method		Containers:
	[]	Preservatives a	added:		
			Method		Containers:
					Containers:
			Method		Containers:
			Method		Containers:
]	CONTAIN	IER HANDLING	;		
		Contain	er Sides Labeled		
			er Lids Taped		
		Contain	ers Placed in Ice Chest		•
]	OTHER C	OMMENTS:			
-					

SAMPLING LOCATION <u>MacDill AFB Pumphouse 75</u> SAMPLING DATE(S) <u>March 1995</u>

GROUND W	VATER SAMPLING RECORD - MONITORING WELLM 175 - MI	w
DATE AND SAMPLE CO WEATHER:	OR SAMPLING: [] Regular Sampling; [] Special Sampling; O TIME OF SAMPLING: 3 24], 19 45 / 11:30 a.m./pm OLLECTED BY: MO/KC of ES Denver : 5 - 75 OR WATER DEPTH MEASUREMENT (Describe): Top of Well Casing	(number)
MONITORI	NG WELL CONDITION: [] LOCKED: WELL NUMBER (\$\foralle{G}^2\$ IS NOT) APPARENT STEEL CASING CONDITION IS: INNER PVC CASING CONDITION IS: WATER DEPTH MEASUREMENT DATUM (\$\foralle{G}^2\$ IS NOT) APPARENT [] DEFICIENCIES CORRECTED BY SAMPLE COLLECTOR [] MONITORING WELL REQUIRED REPAIR (describe):	
Check-off	EQUIPMENT CLEANED BEFORE USE WITH Alconox, Distilled H2O, and A Items Cleaned (List): All Equipment used in sampling	cetone
2 [x]	PRODUCT DEPTH	FT. BELOW DATUM
	WATER DEPTH 13.73 f. 13.79 Measured with: Water Level Probe	FT. BELOW DATUM
3 [x]	WATER-CONDITION BEFORE WELL EVACUATION (Describe): Appearance: Odor: Other Comments:	
4 [x]	WELL EVACUATION: Method: Volume Removed: Observations: Water (slightly - very) cloudy Water level (rose - fell - no change) Water odors: Other comments:	

Ground Water	Sampling Re	ecord - Monitoring	g Well No.	mv-1	(Cont'd)			
5 [x]	SAMPLE EX	XTRACTION ME	ETHOD:					
		[] Bailer made	of:					
		[x] Pump, type:	Peristaltic Pump					
		[] Other, descr	ibe:					
		Sample obtained	is [x] GRAB; []	COMPOS	ITE SAMPLE			
6 [x]	ON SITE M	EASUREMENTS	٠.					
O [X]	ON-SITE M			Measured	with: Orion Instrument			
		nH: 7.0:	<u>. </u>	Measured	with:			
		Conductivity:	18×10 25/cm.	Measured	with: Orion Instrument with: with:	_		
		Dissolved Oxyge	en: 0.19 mc	/Measured	with: Orion Instrument	_		
		Redox Potential:	+ 35 MV	Measured	with: Orion Instrument with:	_		
		Salinity:		Measured	with:			
		Nitrate:		Measured	with:	_		
				Measured	with:			
		Ferrous Iron:			with:	_		
		Other:				—		
7[]	SAMPLE CO	ONTAINERS (ma	aterial, number, size):	1-mel	Long, Moring, Hack	_ 		
8[]	ON-SITE SA	AMPLE TREATM	IENT:					
	[]	Filtration:	Method		Containers:			
	t i	i indution.			Containers:			
					Containers:			
	[]	Preservatives add	ded:					
			Mathad		Containers:			
					Containers:			
					Containers:			
			Method		Containers:			
9[]	CONTAINE	R HANDLING:			,			
	CONTAINER HANDLING.							
	,	() Container	Sides Labeled Lids Taped s Placed in Ice Chest					
10 ()	OTHER CO.	MMENTS:						
10[]	OTHERCO	INTINIEW (2:						
						_		

*

GROUND W	ATER SAMPLING RECORD - MONITORING WELL $M0.75 - \lambda$	713
REASON FO DATE AND SAMPLE CO WEATHER:	OR SAMPLING: Regular Sampling; [] Special Sampling; TIME OF SAMPLING: 3/29, 1995 /4:15 a.m./p.m. OLLECTED BY: MV KC of ES Near 800 R WATER DEPTH MEASUREMENT (Describe): Top of Well Casing	(number)
MONITORI	WELL CONDITION: LOCKED: UNLOCKED WELL NUMBER (19- IS NOT) APPARENT STEEL CASING CONDITION IS: Goc. INNER PVC CASING CONDITION IS: Goc. WATER DEPTH MEASUREMENT DATUM (18-) IS NOT) APPARENT DEFICIENCIES CORRECTED BY SAMPLE COLLECTOR MONITORING WELL REQUIRED REPAIR (describe):	
Check-off 1 [x]	EQUIPMENT CLEANED BEFORE USE WITH Alconox, Distilled H2O, and Items Cleaned (List): All Equipment used in sampling	
2 [x]	PRODUCT DEPTH	FT. BELOW DATUM
	WATER DEPTH c-3.11 4-3.13 Measured with: Water Level Probe	FT. BELOW DATUM
3 [x]	WATER-CONDITION BEFORE WELL EVACUATION (Describe): Appearance: Clew Odor: No Other Comments:	
4 [x]	WELL EVACUATION: Method: Volume Removed: Observations: Water (Slightly - very) cloudy Water level (rose - [el]) no change) Water odors: Other comments:	

[x]	NAMPI I	C CVTD A CTION A	ACTUAD.		
	SAMI LI	E EXTRACTION N	METHOD:		
		[] Bailer ma	de of:		
		[] Other, des	scribe:		
		Sample obtain	ed is [x] GRAB; []	COMPOSITE SAMPLE	
[x]	ON-SITE	E MEASUREMEN	ΓS:		
		Temp: 23	·8 ° _C	Measured with: Orion Instrument	
		pH: 6.6	3	Measured with:	
		Conductivity:	22 ×10 µ5/cm	Measured with:	
			gen: 0.10 mg/	Measured with: Orion Instrument	
		Redox Potentia	al: -6.0 mV	Measured with:	
		Salinity:		Measured with:	
		Nitrate:		Measured with:	
		Sulfate:		Measured with:	
		Ferrous Iron:		Measured with:	
		Other:			
		outer.			
[]	ON-SITE		TATES ITT		
		E SAMPLE TREAT	MENT:		
	[]	Filtration:	Method	Containers:	
			Method	Containers:	
			Method		
			Method Method Method	Containers:	
	[]	Filtration:	Method Method Method	Containers: Containers:	
	[]	Filtration:	Method Method Method dded: Method	Containers: Containers: Containers:	
	[]	Filtration:	Method Method dded: Method Method	Containers: Containers: Containers: Containers:	
	[]	Filtration:	Method Method idded: Method Method Method	Containers: Containers: Containers:	
{ }	[]	Filtration:	Method Method Method Method Method Method Method	Containers: Containers: Containers: Containers: Containers:	
[]	[]	Filtration: Preservatives a	Method Method Method Method Method Method Method	Containers: Containers: Containers: Containers: Containers:	
[]	[]	Filtration: Preservatives a INER HANDLING	Method	Containers: Containers: Containers: Containers: Containers:	
[]	[]	Filtration: Preservatives a INER HANDLING Contain Contain	Method	Containers: Containers: Containers: Containers: Containers: Containers: Containers:	
[]	[]	Filtration: Preservatives a INER HANDLING Contain Contain	Method	Containers: Containers: Containers: Containers: Containers: Containers: Containers:	
	[]	Filtration: Preservatives a INER HANDLING Contain Contain	Method	Containers: Containers: Containers: Containers: Containers: Containers: Containers:	
	[]	Filtration: Preservatives a INER HANDLING Contain Contain	Method	Containers: Containers: Containers: Containers: Containers: Containers: Containers:	
	[]	Filtration: Preservatives a INER HANDLING Contain Contain	Method	Containers: Containers: Containers: Containers: Containers: Containers: Containers:	
0[]	[]	Filtration: Preservatives a INER HANDLING Contain Contain	Method	Containers: Containers: Containers: Containers: Containers: Containers: Containers:	
	[]	Filtration: Preservatives a INER HANDLING Contain Contain	Method	Containers: Containers: Containers: Containers: Containers: Containers: Containers:	

GROUND W	ATER SAMPLING RECORD - MONITORING WELL	M1)75-MW3	(HALU DUP)
			(number)
	OR SAMPLING: [A] Regular Sampling; [] Special Sampling:		
DATE AND	TIME OF SAMPLING: 3/31 , 1995 10:20 DLLECTED BY: MDP/ KC of ES Q		
WEATHER:		<u>-1</u>	
	R WATER DEPTH MEASUREMENT (Describe): Top of W		
	· /		
MONITORD	IC WELL CONDITION.		
MONITORII	NG WELL CONDITION: My LOCKED: [] U	NLOCKED	
	WELL NUMBER ((S)- IS NOT) APPARENT	MEGCRED	
	STEEL CASING CONDITION IS: 6 2		
	INNER PVC CASING CONDITION IS: Cook		
	WATER DEPTH MEASUREMENT DATUM (SE) IS NO		
	[] DEFICIENCIES CORRECTED BY SAMPLE COLLE		
	[] MONITORING WELL REQUIRED REPAIR (describe	e):	
		 	
Check-off			
1 [x]	EQUIPMENT CLEANED BEFORE USE WITH Alconox.	Distilled H2O, and Aceto	ne
- []	Items Cleaned (List): All Equipment used in s		
0.5-3	PRODUCT DEPTH N.P		DELOW DATIN
2 [x]	PRODUCT DEPTH		BELOW DATUM
			
	water depth 4.13	FT.	BELOW DATUM
	Measured with: Water Level Probe		
3 [x]	WATER-CONDITION BEFORE WELL EVACUATION (
	Appearance: C/ea/yellow		
	Odor:	6 11'C	<u></u>
	Odiei Comments.		
4 [x]	WELL EVACUATION:		
	Method: peristaltic		
	Volume Removed: 3500 ml	•	
	Observations: Water (slightly - very) cloud		
	Water level (rose - fell - no	change)	
	Water odors: Mod	erake	
	Other comments:		

round Wa	ater Samplin	g Record - Monitor	ing Well No.	MW-3(Cont'd)
[x]	SAMPL	E EXTRACTION I	METHOD:	
		[] Bailer ma	de of:	
		Sample obtain	ed is [x] GRAB; [] COMPOSITE SAMPLE
5 [x]	ON-SIT	E MEASUREMEN	TS:	
•		Temp: 23	.9 ° C	Measured with: Orion Instrument
		pH: 4.	9°_C	, Measured with:
		Conductivity:	22×10 MS/c	Measured with:
		Dissolved Oxy	gen: 0.17 mg	// Measured with: Orion Instrument
		Redox Potenti	al: -18.4 ml	Measured with:
		Salinity:		Measured with:
		Nitrate:		Measured with:
		Sulfate:		Measured with:
		Ferrous Iron:	 	Measured with:
		Other:		
3[]	ON-SIT	E SAMPLE TREA	TMENT:	
	5 3	Elitration	Mathod	Containers:
	[]	Filtration:		Containers:
				Containers:
			Method	Containers
	[]	Preservatives	added:	
			Method	Containers:
P[]	CONTA	AINER HANDLING) :	
		[] Contain	ner Sides Labeled	
			ier Sides Labeled ier Lids Taped	
			ier Lius Tapeu iers Placed in Ice Che	est
	0000			
10[]	OTHER	COMMENTS:		

GROUND W	ATER SAMPLING RECORD - MONITORING WELL MO 75 - P	1w 4	/HACH	000)
REASON FO DATE AND SAMPLE CO WEATHER:	R SAMPLING: [Regular Sampling; [] Special Sampling; TIME OF SAMPLING: 3/3/, 1915 /3:45 a.m./pmp PLLECTED BY: MO/KC of ES Democration Claractery 75 R WATER DEPTH MEASUREMENT (Describe): Top of Well Casing	(number)		
MONITORIN	WELL CONDITION: Described			
Check-off 1 [x]	EQUIPMENT CLEANED BEFORE USE WITH Alconox, Distilled H2O, and A Items Cleaned (List): All Equipment used in sampling			
2 [x]	PRODUCT DEPTH	FT. BELOW DA	TUM	
	WATER DEPTH 4.79 Measured with: Water Level Probe	FT. BELOW DA	TUM	
3 [x]	WATER-CONDITION BEFORE WELL EVACUATION (Describe): Appearance:			
4 [x]	WELL EVACUATION: Method: Oly 15 falfic Volume Removed: 7 - 0 onl Observations: Water (slightly - very) cloudy Water level (rose - fell - no change) Water odors: Modar at	2nt		

Ground Water	r Sampling Re	ecord - Monitoring	g Well No.	Mw-Y (Cont'd)	
5 [x]	SAMPLE EX	XTRACTION ME	ETHOD:		
		[] Bailer made	of:		
		[x] Pump, type:	Peristaltic Pump		
		[] Other, descr	ibe:		
		Sample obtained	is [v] GRAR: []	COMPOSITE SAMPLE	
		Sample obtained	is [x] OKAB, []	COMI OSITE SAMI EE	
6 [x]	ON-SITE M	EASUREMENTS			
		Temp: 23,-	} ° _C	Measured with: Orion Instrume	
		pH: <u>5,60</u>	2	Measured with:	
		Conductivity:	69 x 10 m5/a	Measured with:	***
		Dissolved Oxyge	en: 0.08 mg/	Measured with: Orion Instrume	nt
				Measured with:	
		Salinity:		Measured with:	
		Nitrate:		Measured with:	
		Sulfate:		Measured with:	
		Ferrous Iron:		Measured with:	
		Other:			
		-			
7[]	SAMPLE CO	ONTAINERS (ma	iterial number size):	1-methane, TE	= H
, į j	SAMI EE C	2-19/1/	C. LACL	(DUP) ADVINE	· (\(\sigma\)
		U - Rma	x my	, note has	
					
8[]	ON-SITE SA	AMPLE TREATM	IENT:		
	[]	Filtration:	Method	Containers:	
	1)	i indution.		Containers:	
			Method	Containers:	
	[]	Preservatives add	ded:		
			Method_	Containers:	
				Containers:	
				Containers:	
				Containers:	
9[]	CONTAINE	R HANDLING:			
		y ,	Sides Labeled		
			Lids Taped		
	•	Container	s Placed in Ice Chest		
10[]	OTHER CO	MMENTS: 1	ACH DWD		
10[]	OTHER CO	1 A.A	NUP-	MD75 - MW 2	y
		LAB	- DUI	1	/

GROUND W	ATER SAMPLING RECORD - MONITORING WELL	-mw 5
REASON FO DATE AND SAMPLE CO	R SAMPLING: [/ Regular Sampling; [] Special Sampling; TIME OF SAMPLING: 3/29', 1995 /0.45 a.m./pdb. OLLECTED BY: MV/KC of ES Denver Winder parting Clauding Top of Well Casing	(number)
MONITORIN	WELL CONDITION: [] LOCKED: WELL NUMBER (6) IS NOT) APPARENT STEEL CASING CONDITION IS: INNER PVC CASING CONDITION IS: WATER DEPTH MEASUREMENT DATUM (5) IS NOT) APPARENT [] DEFICIENCIES CORRECTED BY SAMPLE COLLECTOR [] MONITORING WELL REQUIRED REPAIR (describe):	
Check-off [x]	EQUIPMENT CLEANED BEFORE USE WITH Alconox, Distilled H2O, and Items Cleaned (List): All Equipment used in sampling	Acetone
2 [x]	PRODUCT DEPTH	FT. BELOW DATUM
	WATER DEPTH <u>i 419</u> f - 4. 7 f Measured with: Water Level Probe	_FT. BELOW DATUM
3 [x]	WATER-CONDITION BEFORE WELL EVACUATION (Describe): Appearance:	
4 [x]	WELL EVACUATION: Method: Volume Removed: Observations: Water (slightly - very) cloudy Water level (rose - Cl - no change) Water odors: Other comments:	

ı w	ater Sampling	g Record - Monito	ring Well No.	mw 5	(Cont'd)
	SAMPL	E EXTRACTION	METHOD:		
		[] Bailer m	ade of:		
		[x] Pump, ty	pe: Peristaltic Pum	ID.	
		[] Other, de	escribe:		
		Sample obtain	ned is [x] GRAB;	[] COMPO	OSITE SAMPLE
}	ON-SITI	E MEASUREMEN	NTS:		
•		Temp: 2	<u>-3.7</u> ° _C	Measur	ed with: Orion Instrument
					ed with:
		Conductivity:	10 ps/c	Measur	ed with:
					ed with: Orion Instrument
		Redox Potent	ial: -15.4 100	Measur	ed with:
		Salinity:			ed with:
		Nitrate:			ed with:
		Sulfate			ed with:
		Ferrous Iron:		Measur	ed with:
					·
]	ON-SITI	E SAMPLE TREA	TMENT:		
	[]	Filtration:	Method		Containers:
	. ,				Containers:
					Containers:
	[]	Preservatives	added:		
			Method		Containers:
	CONTA	INER HANDLING	G:		
		Carani	ner Sides Labeled		
		~			
			ner Lids Taped		
		[[/] Contai	ners Placed in Ice C	nest	
	OTHER	COMMENTS:			
			· · · · · · · · · · · · · · · · · · ·		

SAMPLING LOCATION MacDill AFB Pumphouse 7	5
SAMPLING DATE(S) March 1995	

GROUND V	VATER SAMPLING RECORD - MONITORING WELL $_$ $\!$	5-MWG
REASON FO	OR SAMPLING: The Regular Sampling: [] Special Sampling:	(number)
DATE AND	OTIME OF SAMPLING: 9/3/, 1995 14:10 a.m./p. OLLECTED BY: MY/KC of ES Downer : 6/ondy 750	m.
SAMPLE CO	OLLECTED BY: MY/KC of ES Den wer	
WEATHER:	Cloudy 750	
DATUM FO	OR WATER DEPTH MEASUREMENT (Describe): Top of Well Casin	<u> </u>
MONITORI	NG WELL CONDITION:	
MONTOR	M LOCKED: [] UNLOCK	FD
	WELL NUMBER (S)- IS NOT) APPARENT	LD
	STEEL CASING CONDITION IS: Good	
	INNER PVC CASING CONDITION IS:	
	WATER DEPTH MEASUREMENT DATUM (152 IS NOT) APPA	RENT
	[] DEFICIENCIES CORRECTED BY SAMPLE COLLECTOR	
	MONITORING WELL REQUIRED REPAIR (describe):	
Check-off		
1 [x]	EQUIPMENT CLEANED BEFORE USE WITH Alconox, Distilled	H2O, and Acetone
	Items Cleaned (List): All Equipment used in sampling	
2 ()	PRODUCT DEPTH NP	ET DELOW DATEM
2 [x]	PRODUCT DEPTH	FT. BELOW DATUM
	Measured with: Oth water interface Probe	
	WATER DEPTH 3.84	FT. BELOW DATUM
	Measured with: Water Level Probe	FT. BELOW DATOM
	ivicasured with. water bever 1100e	
3 [x]	WATER-CONDITION BEFORE WELL EVACUATION (Describe	١٠
ے زم	Appearance: (car , low)	<i>).</i>
	Appearance: Clear Justow Odor: moderate 34	11. 614
	Other Comments:	
	outer comments.	
4 [x]	WELL EVACUATION:	
	Method: Deristaltic	
	Volume Removed: 7500 ml	
	Observations: Water (slightly - very) cloudy	
	Water level (rose - fell - no change)	
	Water odors: Medare	ut e
	Other comments:	

D

SAME	LE EXTRACTION !	METHOD:		
	[] Bailer ma	nde of:		
	[x] Pump, ty	pe: Peristaltic Pump		
-	Sample obtain	ed is [x] GRAB; [] C	OMPOSITE SAMPLE	
ON-SI	TE MEASUREMEN	TS:		
	Temp: 23.	l ° C N	Measured with: Orion Instrument	
	nH:	6.57	Measured with:	
	Conductivity:	21×10 als/ca. N	Measured with:	
	Dissolved Ox	vgen: 0.18	Measured with: Orion Instrument	
		al: $+8.2 \text{ M}$	Measured with:	
	Salinity:	<u> </u>	Measured with:	
	Nitrate:	N	Measured with:	
	Sulfate:	N	Measured with:	
	Ferrous Iron:		Measured with:	
SAMF	LE CONTAINERS (2-BTL)	material, number, size):	1-merhane, HACE, A	nson
	TE SAMPLE TREA	, voe, Tur	1-merane, HACE, A	nson
	<u>'L-B1(S</u>	TMENT: Method	Containers:	
ON-SI	TE SAMPLE TREA	TMENT: Method		
ON-SI	TE SAMPLE TREA	TMENT: Method Method	Containers:	
ON-SI	TE SAMPLE TREA	TMENT: Method Method	Containers: Containers:	
on-si []	TE SAMPLE TREA	TMENT: Method Method Method added:	Containers: Containers: Containers:	
on-si []	TE SAMPLE TREA	TMENT: Method Method added: Method	Containers: Containers: Containers: Containers:	
on-si []	TE SAMPLE TREA	TMENT: Method Method added: Method Method	Containers: Containers: Containers: Containers: Containers:	
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on-si []	TE SAMPLE TREA	Method Method Method Method Method Method Method Method Method Method Method Method Method Method Method Method	Containers: Containers: Containers: Containers: Containers: Containers:	
on-si []	TE SAMPLE TREATERING. Filtration: Preservatives:	Method Method Method Method Method Method Method Method Method Method Method Method Method Method Method Method	Containers: Containers: Containers: Containers: Containers: Containers:	
on-si []	TE SAMPLE TREATERING. Filtration: Preservatives: AINER HANDLING	Method Me	Containers: Containers: Containers: Containers: Containers: Containers:	
on-si []	TE SAMPLE TREATERING Filtration: Preservatives AINER HANDLING [] Contain [] Contain	Method Me	Containers: Containers: Containers: Containers: Containers: Containers:	
on-si []	TE SAMPLE TREATERING Filtration: Preservatives AINER HANDLING [] Contain [] Contain	Method Me	Containers: Containers: Containers: Containers: Containers: Containers:	
ON-SI	TE SAMPLE TREATERING. Preservatives AINER HANDLING Contain Contain Contain	Method	Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers:	
ON-SI	TE SAMPLE TREATERING. Preservatives AINER HANDLING Contain Contain Contain	Method Me	Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers:	
ON-SI	TE SAMPLE TREATERING. Preservatives AINER HANDLING Contain Contain Contain	Method	Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers:	

SAMPLING LOCATION MacDill AFB Pumphouse 75
SAMPLING DATE(S) March 1995

GROUND W	ATER SAMPLING RECORD - MONITORING WELL MD 75 - M w 7	
DATE AND SAMPLE CO WEATHER:	(number) R SAMPLING: [*] Regular Sampling; [] Special Sampling; TIME OF SAMPLING: **/2 , 1995	
MONITORIN	WELL CONDITION: [] UNLOCKED: WELL NUMBER (18 - IS NOT) APPARENT STEEL CASING CONDITION IS: INNER PVC CASING CONDITION IS: WATER DEPTH MEASUREMENT DATUM (18 - IS NOT) APPARENT [] DEFICIENCIES CORRECTED BY SAMPLE COLLECTOR [] MONITORING WELL REQUIRED REPAIR (describe):	
Check-off 1 [x]	EQUIPMENT CLEANED BEFORE USE WITH Alconox, Distilled H2O, and Acetone Items Cleaned (List): All Equipment used in sampling	
2 [x]	PRODUCT DEPTH	
	WATER DEPTH 3.68 FT. BELOW DATUM Measured with: Water Level Probe	
3 [x]	WATER-CONDITION BEFORE WELL EVACUATION (Describe): Appearance: Clew yellow Odor: moderate HC, - Unen to tell before Other Comments: H.C. & Sulfverce	
4 [x]	WELL EVACUATION: Method:	

ound W	ater Sampling	g Record - Monitorir	ng Well No	LW-7 (Cont'd)			
x]	SAMPLI	E EXTRACTION M	ETHOD:				
		[] Bailer mad	e of:				
		[x] Pump, type	: Peristaltic Pump				
		[] Other, desc	ribe:				
		Sample obtaine	d is [x] GRAB; []	COMPOSITE SAMPLE			
x]	ON-SITE	ON-SITE MEASUREMENTS:					
		Temp: 23	0° C broke 52 HO Asfen	Measured with: Orion Instrument			
		pH: £	roke	Measured with:			
		Conductivity:	52 HO 15/cm	Measured with:			
		Dissolved Oxyg	gen: 0.10 mg/2	Measured with: Orion Instrument			
		Redox Potential	: -88.4 mV	Measured with:			
		Salinity:		Measured with:			
		Nitrate:		Measured with:			
		Sulfate:		Measured with:			
		Ferrous Iron:		Measured with:			
		Other:					
]	ON-SITE	E SAMPLE TREAT	MENT:				
	[]	Filtration:	Method	Containers:			
				Containers:			
				Containers:			
	[]	Preservatives ac	ided:				
			Method	Containers:			
				Containers:			
				Containers:			
				Containers:			
]	CONTA	INER HANDLING:					
		[]	r Sides Labeled				
			r Lids Taped				
		(✓) Containe	rs Placed in Ice Ches	t			
]	OTHER	COMMENTS:					
	 -						
			<u> </u>	· · · · · · · · · · · · · · · · · · ·			

SAMPLING	LOCATIO	N MacDill	AFB	Pumphouse	75
SAMPLING	DATE(S)	March 1995	5		_

GROUND W	ATER SAMPLING RECORD - MONITORING WELL MD 75- MU	บ −8
REASON FO DATE AND SAMPLE CO WEATHER:	R SAMPLING: A Regular Sampling; [] Special Sampling; TIME OF SAMPLING: 3/3/ , 1995 //:/5 a.m./p.m. PLECTED BY: AV/KC of ES Decial Sampling;	(number)
MONITORIN	IG WELL CONDITION:	
oora.	M-LOCKED: [] UNLOCKED	
	WELL NUMBER (S) IS NOT) APPARENT	
	STEEL CASING CONDITION IS: 6 00 d	
	INNER PVC CASING CONDITION IS: 6006	
	WATER DEPTH MEASUREMENT DATUM (S) - IS NOT) APPARENT	
	[] DEFICIENCIES CORRECTED BY SAMPLE COLLECTOR [] MONITORING WELL REQUIRED REPAIR (describe):	
	[] MONTOKING WELL REQUIRED RELATINGUESCHOOP.	
Check-off 1 [x]	EQUIPMENT CLEANED BEFORE USE WITH Alconox. Distilled H2O, and Items Cleaned (List): All Equipment used in sampling	Acetone
2 [x]	PRODUCT DEPTH	FT. BELOW DATUM
	WATER DEPTH	FT. BELOW DATUM
3 [x]	WATER-CONDITION BEFORE WELL EVACUATION (Describe): Appearance: Cea / y e law Odor: Stran H.C. Other Comments: Ellin present	
4 [x]	WELL EVACUATION: Method: Volume Removed: Observations: Water (slightly - very) cloudy Water level (rose - fell - no change) Water odors: Other comments:	

ound W	ater Samplin	g Record - Monito	ring Well No.	MW 8 (Cont'd)
x]	SAMPL	E EXTRACTION	METHOD:	
		[] Bailer m	ade of:	
		[x] Pump, ty	pe: Peristaltic Pump	
		[] Other, de	escribe:	
		Sample obtain	ned is [x] GRAB; []	COMPOSITE SAMPLE
[x]	ON-SITI	E MEASUREMEN	NTS:	
		Temp: 21	38 610 as/cm	Measured with: Orion Instrument
		pН: 4 .	83	Measured with:
		Conductivity:	38 x10 des/con	Measured with:
		Dissolved Ox	ygen: 0.08 mg/e	Measured with: Orion Instrument
		Redox Potent	ial: ~95,7 mv	Measured with:
		Salinity:		Measured with:
		Nitrate:		Measured with:
		Sulfate:		Measured with:
		Ferrous Iron:		Measured with:
[]	ON-SITI	E SAMPLE TREA	TMENT:	
. ,	C 3	Eliteration	Mathad	Containann
	[]	Filtration:		Containers:
				Containers:Containers:
			Method	Containers
	[]	Preservatives	added:	
			Method	Containers:
				Containers:
				Containers:
			Method	Containers:
]	CONTA	INER HANDLING	G :	
			ner Sides Labeled	
			ner Lids Taped	
		Contain	ners Placed in Ice Chest	
[]	OTHER	COMMENTS:		
- •				

SAMPLING LOCATION MacDill AFB Pumphouse 75
SAMPLING DATE(S) March 1995

GROUND W	ATER SAMPLING RECORD - MONITORING WELLMD 75 -	MAN9
REASON FO	OR SAMPLING: A Regular Sampling; [] Special Sampling; TIME OF SAMPLING: 3 3 3 , 1995 /6:00 a.m./p.m. OLLECTED BY: 600 / KC of ES	(number)
WEATHER:		
MONITORI	WELL CONDITION: JULY LOCKED: WELL NUMBER (19) IS NOT) APPARENT. STEEL CASING CONDITION IS:	
	INNER PVC CASING CONDITION IS: WATER DEPTH MEASUREMENT DATUM (9 - IS NOT) APPARENT [] DEFICIENCIES CORRECTED BY SAMPLE COLLECTOR [] MONITORING WELL REQUIRED REPAIR (describe):	
Check-off 1 [x]	EQUIPMENT CLEANED BEFORE USE WITH Alconox, Distilled H2O, and Items Cleaned (List): All Equipment used in sampling	1 Acetone
2 [x]	PRODUCT DEPTH	FT. BELOW DATUM
	WATER DEPTH 4, 76 4 - 4, 48 Measured with: Water Level Probe	FT. BELOW DATUM
3 [x]	WATER-CONDITION BEFORE WELL EVACUATION (Describe): Appearance: Clear wellow Odor: Strong Sulfur Other Comments:	
4 [x]	WELL EVACUATION: Method: Volume Removed: Observations: Water (slighly - very) cloudy Water level (rose - P - no change) Water odors: Other comments:	

Ground Water	Sampling Re	cord - Monitoring	g Well No.	mu 7	(Cont'd)
5 [x]	SAMPLE EX	CTRACTION ME	ETHOD:		
		[] Bailer made	of:		
			-		
		Sample obtained	is [x] GRAB; []	COMPOS	ITE SAMPLE
6 [x]	ON-SITE M	EASUREMENTS	i :		
- ()		Temp: 22.8	3_° _C	Measured	with: Orion Instrument
		pH: 7,1	4 29×10 as/cm	Measured	with:
		Conductivity:	29×10 a15/cm	Measured	with:
		Dissolved Oxyge	en: 0.12 my/2	Measured	with: Orion Instrument
		Redox Potential:	-120.8 mv	Measured	with:
		Salinity:			with:
		Nitrate:		Measured	with:
		Sulfate:		Measured	with:
		Ferrous Iron:			with:
		Other:		<u> </u>	
7[]	SAMPLE CO	ONTAINERS (ma 2 - 13 T	aterial, number, size):	yoc	thane, # Hack, Anions
8[]	ON-SITE SA	MPLE TREATM	MENT:		
	[]	Filtration:	Method		Containers:
					Containers:
			Method		Containers:
	[]	Preservatives ad	ded:		
			Method		Containers:
					Containers:
					Containers:
			Method		Containers:
9[]	CONTAINE	R HANDLING:			
	l	[] Container	Sides Labeled Lids Taped s Placed in Ice Chest		
10[]	OTHER CO	MMENTS:			
					

	SAMPLING DATE(S) March 1995
GROUND V	WATER SAMPLING RECORD - MONITORING WELL MD75 - MW/D
	(number)
REASON F	OR SAMPLING: [X] Regular Sampling; [] Special Sampling;
DATE AND	TIME OF SAMPLING: 3/30/95, 19 a.m./p.m.
SAMPLE C	OLLECTED BY: MY/KC of ES Denver
	5 mry 85°
DATUM FC	DR WATER DEPTH MEASUREMENT (Describe): Top of Well Casing
MONITORI	ING WELL CONDITION:
oruroid	
	WELL NUMBER (19) IS NOT) APPARENT
	STEEL CASING CONDITION IS: Cook
	INNER PVC CASING CONDITION IS: 600
	WATER DEPTH MEASUREMENT DATUM (129- IS NOT) APPARENT
	[] DEFICIENCIES CORRECTED BY SAMPLE COLLECTOR
	[] MONITORING WELL REQUIRED REPAIR (describe):
Check-off	
l [x]	EQUIPMENT CLEANED BEFORE USE WITH Alconox, Distilled H2O, and Acetone
r (x)	Items Cleaned (List): All Equipment used in sampling
	nems cleaned (Elst). An Edulphient used in sampling
2 [x]	PRODUCT DEPTHFT. BELOW DATUM
	Measured with: Oil/ Water Interface Probe
	WATER DEPTH 4.3.75 f. 3.77 FT. BELOW DATUM
	Measured with: Water Level Probe
3 [x]	WATER-CONDITION BEFORE WELL EVACUATION (Describe):
رم) د	Appearance: Clear Justion
	Odor: moderale Sulfuric
	Other Comments:
	~ H1 ~ ~ (1111) ~ (114)

Other comments:_

SAMPLING LOCATION MacDill AFB Pumphouse 75

m:\forms\gwsample.doc Page 1 of 2

4 [x]

WELL EVACUATION:

Method:_

Volume Removed:

Observations:

SAM	SAMPLE EXTRACTION METHOD:						
	[] Bailer ma	ade of:					
	[x] Pump, ty	pe: Peristaltic Pump					
	[] Other, de	scribe:					
	Sample obtain	ed is [x] GRAB; [] C	OMPOSITE SAMPLE				
ON-	ON-SITE MEASUREMENTS:						
	Temp: 24,		leasured with: Orion Instrument				
	рН: 6.4	9 <i>5</i> N	leasured with:				
	Conductivity:		leasured with:				
	Dissolved Oxy	ygen: 0.12 mulo M	leasured with: Orion Instrument				
	Redox Potenti	al: -88.4 ml N	leasured with:				
	Salinity:		leasured with:				
	Nitrate:	M	leasured with:				
	Sulfate:		leasured with:				
	Ferrous Iron:		leasured with:				
SAM	IPLE CONTAINERS (2 - BT	material, number, size): _/ 24 , VOC , T	1-MITHANE, ANION, H	tact			
ON-	SITE SAMPLE TREA	TMENT:					
		TMENT:	Containers:				
ON-	SITE SAMPLE TREA	TMENT: Method Method	Containers:Containers:				
ON-	SITE SAMPLE TREA	TMENT: Method Method	Containers:				
ON-	SITE SAMPLE TREA	TMENT: Method Method Method	Containers:Containers:				
ON-:	SITE SAMPLE TREA	TMENT: Method Method Method added:	Containers: Containers: Containers:				
ON-:	SITE SAMPLE TREA	TMENT: Method Method Method added: Method	Containers: Containers: Containers: Containers:				
ON-:	SITE SAMPLE TREA	TMENT: Method Method added: Method Method Method	Containers: Containers: Containers: Containers: Containers:				
ON-:	SITE SAMPLE TREA	TMENT: Method Method added: Method Method Method Method	Containers: Containers: Containers: Containers: Containers: Containers:				
ON-:	SITE SAMPLE TREA	TMENT: Method Method added: Method Method Method Method	Containers: Containers: Containers: Containers: Containers:				
ON-:	SITE SAMPLE TREA	Methodadded: Methodadded: Methodadded: MethodMethodMethodMethodMethodMethodMethodMethodMethodMethodMethodMethod	Containers: Containers: Containers: Containers: Containers: Containers:				
ON-:	Filtration: Preservatives TAINER HANDLING	Methodadded: Methodadded: Methodadded: MethodMethodMethodMethodMethodMethodMethodMethodMethodMethodMethodMethod	Containers: Containers: Containers: Containers: Containers: Containers:				
ON-:	Filtration: Preservatives ITAINER HANDLING [Method	Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers:				
ON-:	Filtration: Preservatives ITAINER HANDLING [Method	Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers:				

SAMPLING LOCATION MacDill AFB Pumphouse 75
SAMPLING DATE(S) March 1995

GROUND W	ATER SAMPLING RECORD - MONITORING WELL MO 75 -M	1W 11
DATE AND SAMPLE COWEATHER:	R SAMPLING: Regular Sampling; [] Special Sampling; TIME OF SAMPLING: 3 3 3 , 1995a.m./p.m. DLLECTED BY KC of ES R WATER DEPTH MEASUREMENT (Describe): Top of Well Casing	(number)
MONITORIN	WELL CONDITION: NOTICE NOTICE NOTICE NOTICE NOTICE	
Check-off 1 [x]	EQUIPMENT CLEANED BEFORE USE WITH Alconox, Distilled H2O, and Items Cleaned (List): All Equipment used in sampling	1 Acetone
2 [x]	PRODUCT DEPTH	FT. BELOW DATUM
	WATER DEPTH <u>e 3,99 f-4.05</u> Measured with: Water Level Probe	FT. BELOW DATUM
3 [x]	WATER-CONDITION BEFORE WELL EVACUATION (Describe): Appearance: Odor: Other Comments:	
4 [x]	WELL EVACUATION: Method: Volume Removed: Observations: Water (slightly - very) cloudy Water level (rose - fert - no change) Water odors: Other comments:	

nd Wat					
]	SAMPLE	EXTRACTION MET	THOD:		
		[] Bailer made	of:		
		[x] Pump, type:_	Peristaltic Pump		
		[] Other, descri	be:		
		Sample obtained i	s [x] GRAB; []	COMPOSITE SAMPLE	
]	ON-SITE	MEASUREMENTS:			
1	311 3172	Temp: 23,7		Measured with: Orion Instrument	
		pН:	76	Measured with:	
		Conductivity: 1	1410 us/an	Measured with:	
		Dissolved Oxyger	1: Odl ma/e	Measured with: Orion Instrument	
		Redox Potential:	-23.4 ml	Measured with:	
		Salinity:		Measured with:	
		Nitrate:		Measured with:	
		Sulfate:		Measured with:	
		Ferrous Iron:		Measured with:	
}	SAMPLE	CONTAINERS (mat	erial, number, size)	1-Anian, AK, HACH, M	1eTHAU
]		CONTAINERS (mat Z - G T Q ·	F, VOC , 7	VH HACH, N	<u> </u>
	ON-SITE	SAMPLE TREATM	ENT:	v#	
		SAMPLE TREATM	ENT: Method	Containers:	
	ON-SITE	SAMPLE TREATM	ENT: Method Method	v#	
	ON-SITE	SAMPLE TREATM	ENT: Method Method Method	Containers: Containers:	
	on-site	SAMPLE TREATM	ENT: Method Method Method ed:	Containers: Containers: Containers:	
	on-site	SAMPLE TREATM	ENT: Method Method Method Method Method	Containers: Containers: Containers: Containers:	
	on-site	SAMPLE TREATM	ENT: Method Method ed: Method Method Method	Containers: Containers: Containers: Containers: Containers:	
	on-site	SAMPLE TREATM	ENT: Method Method ed: Method Method Method	Containers: Containers: Containers: Containers:	
	ON·SITE	SAMPLE TREATM	ENT: Method Method ed: Method Method Method Method Method Method	Containers: Containers: Containers: Containers: Containers: Containers: Containers:	
]	ON·SITE	SAMPLE TREATM Filtration: Preservatives add	ENT: Method Method ed: Method Method Method Method Method Method Method Method	Containers: Containers: Containers: Containers: Containers: Containers: Containers:	
]	ON·SITE	SAMPLE TREATM Filtration: Preservatives add NER HANDLING:	ENT: Method Method ed: Method Method Method Method Method Method Method Method Method	Containers: Containers: Containers: Containers: Containers: Containers: Containers:	
]	ON·SITE	SAMPLE TREATM: Filtration: Preservatives add: NER HANDLING: [] Container S.	ENT: Method Method Method ed: Method Method Method Method Method Method Method Method Method	Containers: Containers: Containers: Containers: Containers: Containers: Containers:	
]	ON·SITE	SAMPLE TREATM: Filtration: Preservatives add: NER HANDLING: [] Container S.	ENT: Method Method ed: Method Method Method Method Method Method Method Method Method	Containers: Containers: Containers: Containers: Containers: Containers: Containers:	
]	ON-SITE [] [] CONTAIN	SAMPLE TREATM: Filtration: Preservatives add: NER HANDLING: [] Container S.	ENT: Method Method Method Method Method Method Method Method Method Method Method Placed in Ice Chest	Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers:	
	ON-SITE [] [] CONTAIN	SAMPLE TREATM Filtration: Preservatives add NER HANDLING: [] Container S [] Container S [] Container S	ENT: Method Method Method Method Method Method Method Method Method Method Method Placed in Ice Chest	Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers:	

GROUND W	ATER SAMPLING RECORD - MONITORING WELL MO 75 - m	w 12
		(number)
	OR SAMPLING: [A Regular Sampling; [] Special Sampling;	,
	TIME OF SAMPLING: 3/31, 1995 9:30 a.m./p.m.	
	DLLECTED BY: Denser of ES Denser	
	# P. Cloudy 750	
DATUM FOI	R WATER DEPTH MEASUREMENT (Describe): Top of Well Casing	
MONITORIN	NG WELL CONDITION:	
MOMTOIG	M LOCKED: [] UNLOCKED	
	WELL NUMBER (S) IS NOT) APPARENT	
	STEEL CASING CONDITION IS: Good	
	INNER PVC CASING CONDITION IS: Good	
	WATER DEPTH MEASUREMENT DATUM (S)- IS NOT) APPARENT	
	[] DEFICIENCIES CORRECTED BY SAMPLE COLLECTOR	
	[] MONITORING WELL REQUIRED REPAIR (describe):	
Check-off		
l [x]	EQUIPMENT CLEANED BEFORE USE WITH Alconox. Distilled H2O, and	
	Items Cleaned (List): All Equipment used in sampling	
2 [x]	PRODUCT DEPTH N	FT. BELOW DATUM
2 [^]	Measured with: Oil/ Water Interface Probe	
	Model of William The Transport of The Transport of The Transport of Tr	
	WATER DEPTH 3, //	FT. BELOW DATUM
	Measured with: Water Level Probe	
3 [x]	WATER-CONDITION BEFORE WELL EVACUATION (Describe):	
	Appearance: (low yellow)	
	Odor: Strang H.C	
	Other Comments:	
4.5.3	WELL BY A GUARION	
4 [x]	WELL EVACUATION: Method: Peristallic	
	Method: Peristaltic Volume Removed: 2500 ml	
	Observations: Water (stightly - very) cloudy	
	Water level (rose - fell - no change)	
	Water odors: Struc H.C.	
		ent

	SAMPLE	EXTRACTION	METHOD:		
		[] Bailer ma	nde of:		
		[x] Pump, ty	pe: Peristaltic Pump		
		Sample obtain	ed is [x] GRAB; []	COMPOSITE SAMPLE	
	ONICITE	MEASUREMEN	TC.		
	ON-SITE		8 ° _c	Measured with: Orion Instrument	
		nu. 1	<u>,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,</u>		
		Conductivity	13 × 10 µs/cm	Measured with:	
		Dissolved Ov	vgen: 0.09	Measured with: Orion Instrument	
		Redov Potenti	ygen: 0.09 m/l al: -98.2 m	Measured with:	
•		Salinity:	ai. 10.2 MU	Measured with:	
		Nitrate:		Measured with:	
		Sulfate:		Measured with:	
		Ferrous Iron:		Measured with:	
		Other:			
				/-Anion, HACH, Methy, Tell,	, A) K
		CONTAINERS (2 - BTe.	TMENT:		
			TMENT:	Containers:	
	ON-SITE	SAMPLE TREA	TMENT: Method Method	Containers:Containers:	
	ON-SITE	SAMPLE TREA	TMENT: Method Method	Containers:	
	ON-SITE	SAMPLE TREA	TMENT: Method Method Method	Containers:Containers:	
	ON-SITE	SAMPLE TREA	TMENT: Method Method Method added:	Containers: Containers: Containers:	
	ON-SITE	SAMPLE TREA	TMENT: Method Method Method added: Method	Containers: Containers: Containers: Containers:	
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	ON-SITE	SAMPLE TREA	TMENT: Method Method Method added: Method Method	Containers: Containers: Containers: Containers:	
	ON-SITE	SAMPLE TREA	Method Method Method added: Method Method Method Method Method Method	Containers: Containers: Containers: Containers: Containers: Containers:	
	ON-SITE	Filtration: Preservatives	Method Me	Containers: Containers: Containers: Containers: Containers: Containers:	
	ON-SITE	Filtration: Preservatives NER HANDLING	TMENT: Method Method added: Method Method Method Method Method S: ner Sides Labeled	Containers: Containers: Containers: Containers: Containers: Containers:	
	ON-SITE	Filtration: Preservatives NER HANDLING Contain Contain	Method Method added: Method Method Method Method Method Method S: ner Sides Labeled her Lids Taped	Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers:	
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	ON-SITE	Filtration: Preservatives NER HANDLING [] Contain	Method Method Method added: Method Method Method Method Method S: ner Sides Labeled ner Lids Taped ners Placed in Ice Chest	Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers:	
	ON-SITE	Filtration: Preservatives NER HANDLING [] Contain	Method Method added: Method Method Method Method Method Method S: ner Sides Labeled her Lids Taped	Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers:	
	ON-SITE	Filtration: Preservatives NER HANDLING [] Contain	Method Method Method added: Method Method Method Method Method S: ner Sides Labeled ner Lids Taped ners Placed in Ice Chest	Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers:	

GROUND W	ATER SAMPLING RECORD - MONITORING WELL 2500 MD	75-MW/3
DATE AND SAMPLE CO WEATHER:	OR SAMPLING: [1] Regular Sampling; [1] Special Sampling; TIME OF SAMPLING: 3/30, 19.95 a.m./p.m. OLLECTED BY: MO/KC of ES Demonstration of ES Demo	(number)
MONITORIN	WELL CONDITION: [ACLOCKED: WELL NUMBER (S) IS NOT) APPARENT STEEL CASING CONDITION IS: INNER PVC CASING CONDITION IS: WATER DEPTH MEASUREMENT DATUM (S) IS NOT) APPARENT [] DEFICIENCIES CORRECTED BY SAMPLE COLLECTOR [] MONITORING WELL REQUIRED REPAIR (describe):	
Check-off 1 [x]	EQUIPMENT CLEANED BEFORE USE WITH Alconox, Distilled H2O, and Items Cleaned (List): All Equipment used in sampling	Acetone
2 [x]	PRODUCT DEPTH	_FT. BELOW DATUM
	WATER DEPTH 24.05 F-4.09 Measured with: Water Level Probe	_FT. BELOW DATUM
3 [x]	WATER-CONDITION BEFORE WELL EVACUATION (Describe): Appearance: Clear Jyellor Odor: moderale Sulfur Other Comments:	
4 [x]	WELL EVACUATION: Method: Volume Removed: Observations: Water (slightly - very) cloudy Water level (rose - In - no change) Water odors: Other comments:	

m:\forms\gwsample.doc Page 1 of 2

•

				hw 13 (Cont'd)			
	SAMPLE	EXTRACTION	METHOD:				
		[] Bailer ma	ade of:				
		[x] Pump, ty	pe: Peristaltic Pump				
		Sample obtain	ned is [x] GRAB; []	COMPOSITE SAMPLE			
	ON-SITE	MEASUREMEN					
		Temp: 2 4	·4 ° _C_	Measured with: Orion Instrument			
		pH: 7.	29	Measured with:			
		Conductivity:	41 ×10 pislam	Measured with:			
		Dissolved Ox	ygen: 0.11 mg/P	Measured with: Orion Instrument			
		Redox Potent	ial: _ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~	Measured with:			
		Salinity:		Measured with:			
		Nitrate:		Measured with:			
		Sulfate:		Measured with:			
		Ferrous Iron:		Measured with:			
		Other:					
	ON-SITE	SAMPLE TREA	TMENT:				
	[]	Filtration:	Method	Containers:			
	()			Containers:			
				Containers:			
	[]	Preservatives	added:				
			1 d d				
				Containers:			
				Containers:			
				Containers:			
			Method	Containers:			
	CONTAIR	NER HANDLING	G:				
		./-					
			ner Sides Labeled				
			ner Lids Taped				
			ners Placed in Ice Chest				
	Containers Placed in Ice Chest						
1	OTHER (•					
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l	OTHER C	•					

SAMPLING LOCATION <u>MacDill AFB Pumphouse 75</u> SAMPLING DATE(S) <u>March 1995</u>

GROUND W	ATER SAMPLING RECORD - MONITORING WELL MO 75 - M	w 14
REASON FO DATE AND SAMPLE CO WEATHER:	OR SAMPLING: N Regular Sampling; [] Special Sampling; TIME OF SAMPLING: 3 3 , 1995 / 2:15 a.m./p.m. OLLECTED BY: MV KC of ES Den wo	(number)
MONITORI	NG WELL CONDITION:	
	-K1 LOCKED: [1 UNLOCKED	
	WELL NUMBER (15 - IS NOT) APPARENT STEEL CASING CONDITION IS:	
	INNER PVC CASING CONDITION IS: Good	
	WATER DEPTH MEASUREMENT DATUM (18- IS NOT) APPARENT	
	DEFICIENCIES CORRECTED BY SAMPLE COLLECTOR	
	[] MONITORING WELL REQUIRED REPAIR (describe):	
Check-off 1 [x]	EQUIPMENT CLEANED BEFORE USE WITH Alconox, Distilled H2O, and Items Cleaned (List): All Equipment used in sampling	
2 [x]	PRODUCT DEPTH NP	FT. BELOW DATUM
_ []	Measured with: Oil/ Water Interface Probe	
	WATER DEPTH 4.0/	FT. BELOW DATUM
	Measured with: Water Level Probe	
3 [x]	WATER-CONDITION BEFORE WELL EVACUATION (Describe): Appearance: (ear y el low Odor: Strong H, C, ? (Hpen Other Comments:	10 1011
4 [x]	WELL EVACUATION: Method: Volume Removed: Observations: Water (slightly - very) cloudy Water level (rose - fell - no change) Water odors: Other comments:	

Ground Water	Sampling Re	cord - Monitoring	Well No	w 14	(Cont'd)
5 [x]	SAMPLE EX	XTRACTION ME	THOD:		
		[] Bailer made	of:		
		[x] Pump, type:	Peristaltic Pump		
					
		-	is [x] GRAB; []	COMPOSI	TE SAMPLE
6 [x]	ON-SITE M	EASUREMENTS _			
		Temp:	°C		with: Orion Instrument
		pH:		Measured v	with:with:
		Dissolved Oxyge		Measured v	With: Orion Instrument
		Redox Potential	····	Measured v	with: <u>Orion Instrument</u> with:
		Salinity:		Measured v	with:
		Nitrate:		Measured v	with:
		Sulfate:		Measured v	with:
		Ferrous Iron:		Measured v	with:
		Other:			
7[]	SAMPLEC	2-BTe	Y VOC	JH THE	12, HACH Anians
8[]	ON-SITE SA	AMPLE TREATM	IENT:		
	[]	Filtration:	Method	(Containers:
			Method		Containers:
			Method	(Containers:
	[]	Preservatives add	ied:		
			Method		Containers:
					Containers:
					Containers:
			Method		Containers:
9[]	CONTAINE	R HANDLING:			
		es Compoins	Sides Labeled		
	•	. .	Lids Taped		
	1		s Placed in Ice Chest		
	•	() Comumor.	7 1 1200 2 117 100 0 1100 1		
10[]	OTHER CO	MMENTS:		<u> </u>	
	,				
			-	· · · - · · ·	

SAMPLING LOCATION MacDill AFB Pumphouse 7.	5
SAMPLING DATE(S) March 1995	

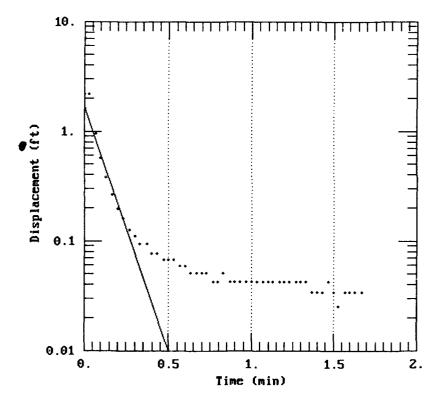
GROUND W	ATER SAMPLING RECORD	- MONITORING WELL,	M075-MW	15
REASON FO DATE AND T SAMPLE CO WEATHER:_	R SAMPLING: N Regular SETIME OF SAMPLING: 1/2 LLECTED BY: MY/KC Sun May WATER DEPTH MEASURE	ampling; [] Special Sampl 	ling; a.m./p.m. 	(number)
MONITORIN	G WELL CONDITION: LOCKED: WELL NUMBER (G)- IS NO STEEL CASING CONDITIO INNER PVC CASING COND WATER DEPTH MEASURE DEFICIENCIES CORRE MONITORING WELL R	OT) APPARENT N IS: Good DITION IS: Good MENT DATUM (S- IS NO CTED BY SAMPLE COLLE	ECTOR	
Check-off 1 [x]	EQUIPMENT CLEANED BE Items Cleaned (I	FORE USE WITH <u>Alconox</u> List): <u>All Equipment used in s</u>		
2 [x]	PRODUCT DEPTH	N P Oil/ Water Interface Probe		_FT. BELOW DATUM
	WATER DEPTH Measured with:	3, b 3 Water Level Probe		_FT. BELOW DATUM
3 [x]	Odor:	PRE WELL EVACUATION (# text yellow week 3 w	furic	
4 [x]	WELL EVACUATION: Method: Volume Remove Observations:			

round Water	Sampling Re	cord - Monitoring	g Well No	mw' 15 (Cont'd)			
[x]	SAMPLE EXTRACTION METHOD:						
		[] Bailer made	of:				
		[x] Pump, type:	Peristaltic Pump				
							
		Sample obtained	is [x] GRAB; []	COMPOSITE SAMPLE			
[x]	ON-SITE MEASUREMENTS:						
		Temp: フ ユ	<u>1 ° _C</u>	Measured with: Orion Instrument			
		pH:	Broke	Measured with: Orion Instrument Measured with: Measured with:			
		Conductivity:	<u> 33 x10</u> M5/LM	Measured with:			
		Dissolved Oxyge	en: Dilb meg	Measured with: Orion Instrument			
		Redox Potential:		Measured with:			
		Salinity:		Measured with:			
		Nitrate:		Measured with:			
		Sulfate:		Measured with:			
				Measured with:			
[]		AMPLE TREATM		Cartainami			
	{ }	Filtration:		Containers:			
				Containers: Containers:			
			Mediod	Containers:			
	[]	Preservatives added:					
			Method	Containers:			
				Containers:			
				Containers:			
				Containers:			
[]	CONTAINER HANDLING:						
.,							
			Sides Labeled				
			Lids Taped				
		[] Containers	s Placed in Ice Chest				
0[]	OTHER CO	MMENTS:					
		 					
							

SAMPLING LOCATION <u>MacDill AFB Pumphouse 75</u> SAMPLING DATE(S) <u>March 1995</u>

GROUND W	VATER SAMPLING RECORD - MONITORING WELL $\frac{10075}{2}$	MW 16
		(number)
REASON FO	OR SAMPLING: Regular Sampling; [] Special Sampling;	
	TIME OF SAMPLING: 3/2031, 1995 8175 acm./p.m.	
	OLLECTED BY: MY/KC of ES Demus	
	Smy 70°	
DATUM FO	R WATER DEPTH MEASUREMENT (Describe): Top of Well Casing	
MONITORI	NG WELL CONDITION:	
MONITORI	MALLOCKED: [] UNLOCKED	
	WELL NUMBER (8 - IS NOT) APPARENT	
	STEEL CASING CONDITION IS:	
	INNER PVC CASING CONDITION IS: 600	
	WATER DEPTH MEASUREMENT DATUM (45-15 NOT) APPARENT	
	[] DEFICIENCIES CORRECTED BY SAMPLE COLLECTOR	
	MONITORING WELL REQUIRED REPAIR (describe):	
Check-off		
1 [x]	EQUIPMENT CLEANED BEFORE USE WITH Alconox, Distilled H2O, and	i Acetone
	Items Cleaned (List): All Equipment used in sampling	
21.	PRODUCT DEPTH NP	
2 [x]		FT. BELOW DATUM
	Measured with: Oil/ Water Interface Probe	·
	WATER DEPTH 3,34	FT. BELOW DATUM
	Measured with: Water Level Probe	r. below Datow
	Measured with. Water Level Flode	
3 [x]	WATER-CONDITION BEFORE WELL EVACUATION (Describe):	
- ()	Appearance: Clear Juellar	
	Odor: Strang Hice	
	Other Comments:	
4 [x]	WELL EVACUATION:	
	Method: peristaltic	
	Volume Removed: 2500 mg	
	Observations: Water (slightly - very) cloudy	
	Water level (rose - fell - no change)	
	Water odors: Stag H. C	
	Other comments:	m present

Ground Water	Sampling R	ecord - Monitorin	g Well No.	(Cont'd)			
5 [x]	SAMPLE EXTRACTION METHOD:						
		[] Bailer made	e of:				
		[x] Pump, type:	: Peristaltic Pump				
		Sample obtained	lis [x] GRAB; []	COMPOSITE SAMPLE	 -		
(()	ON-SITE MEASUREMENTS:						
6 [x]	ON-SITE N	Temp: 23.4		Magazined with: Origin Instrument			
		Temp:		Measured with: Orion Instrument			
		pri	H) J 12 45/60	Measured with:			
		Dissolved Over	on: A 11	Measured with Orion Instrument			
				Measured with: Orion Instrument			
			-9.9 ml				
		Salinity:		Measured with:			
		Nitrate:		Measured with:			
		Sulfate: Ferrous Iron:		Measured with:			
		Other:		ivicasured witti			
7[]	SAMPLE C	ONTAINERS (m: 2 - Brex	aterial, number, size)	: /- Meithant, Aria H	<u>aciq</u>		
8[]	ON-SITE S	AMPLE TREATM	MENT:				
	[]	Filtration:	Method	Containers:			
	()	i mation.		Containers:			
				Containers:			
	[]	Preservatives ad					
	1 3	riescivatives au	ded.				
			Method	Containers:			
			Method	Containers:			
			Method	Containers:			
			Method	Containers:	·		
9[]	CONTAINER HANDLING:						
			Sides Labeled				
			Lids Taped	•			
		Container	rs Placed in Ice Chest	l			
10[]	OTHER CO	MMENTS:					
L J	JDi. ()(
	 _	·					
							



DATA SET: PH7513R3.AQT 07/06/95

AQUIFER MODEL: Unconfined SOLUTION METHOD: Bouwer-Rice

TEST DATA: H0= 2.19 ft r_C= 0.0833 ft r_W= 0.333 ft L = 9. ft b = 19. ft H = 9.3 ft

PARAMETER ESTIMATES: K = 0.04702 ft/min y0 = 1.7 ft

April 4, 1995

MacDill Air Force Base Site 57 Coordinate Data

	Point	Identification	North	East	Elevation
	1	N APRON 4	1279802.6000	494886.4990	8.65
	2	N APRON 3	1279045.4380	495595.4450	7.40
	100	0 SET	1279045.4144	495595.4671	7.45
1.m160 -	200	Ground Shot	1279830.9928	494740.4344	8.06
. ,	201	MD 75 MW 02	1279831.2717	494745.2614	8.21
	202	Ground Shot	1279831.0504	494742.2670	8.37
	203	75 SD-3 Ground Shot	1279816.1621	494756.3473	8.09
	204	MD75-MW01	1279943.1085	494645.1378	8.91
	205	Ground Shot	1279940.2685	494647.4511	9.08
	206	75MP-5D-75SS-5	1279938.4585	494648.9858	8.82
	207	75SS-3 Ground Shot	1279844.7123	494687.8364	9.15
	208	Ground Shot 75SD-2	1279766.9146	494710.7244	7.95
	209	75 SW-1 75 SD-4	1279759.0616	494730.2227	9.31
	210	75MP-7S-7D	1279692.4979	494785.1800	9.50
	211	Ground Shot	1279693.4093	494784.5572	9.84
	212	MD75MW13	1279658.5772	494720.3632	9.14
	213	Ground Shot 75SS-6	1279661.8265	494722.7368	9.29
	214	75MP 8S-8D	1279614.8092	494764.2600	9.27
	215	Ground Shot	1279615.3790	494763.2564	9.42
[216	75MP-9S-9D	1279611.2265	494670.6001	9.35
	217	Ground Shot	1279610.2532	494671.6309	9.65
ſ	218	75SD-2 Ground Shot	1279766.9586	494710.7228	7.95
ĺ	219	MD75MW11	1279739.0859	494707.251i	9.14
	220	Ground Shot	1279740.8310	494706.2405	9.21
		Ground Shot 75SD-1	1279726.0788	494674.3213	8.04
	222	75MP-2S	1279717.0078	494661.5998	8.22
ĺ	223	MD75MW16	1279711.0766	494655.9220	8.34
	224	MD75MW12	1279722.2266	494658.3194	8.21
	225	Ground Shot	1279716.5613	494657.2221	8.31
[226	MD75MW03	1279689.0058	494612.5550	9.30
	227	Ground Shot	1279686.7207	494613.5007	9.42
	228	75MP-1S-1D	1279726.7594	494551.0218	9.01
	229	Ground Shot	1279728.0701	494549.9999	9.16
	230	MD75MW08	1279751.7337	494574.2064	9.01
		75SS-2 Ground Shot	1279756.0583	494571.8365	9.31
		MD75MW10	1279758.4534	494646.7751	8.92
	233	Ground Shot	1279759.5281	494648.0773	9.13
		MD75MW09	1279809.9930	494633.7265	9.50
į		75SS-1 Ground Shot	1279808.5005	494630.9104	9.48
	236	MD75MW04	1279829.3036	494513.9899	9.06

Prepared by: Landmark Engineering & Surveying Corporation

For: PARSONS ENGINEERING SCIENCE, INC.

Sheet 5 of 6

April 4, 1995

MacDill Air Force Base Site 57 Coordinate Data

Point	Identification	North	East	Elevation
237	MD75MW14	1279821.1985	494513.1259	9.07
238	75MP-4S	1279823.6120	494517.7612	8.97
239	Ground Shot	1279824.3951	494514.1894	9.09
240	75MP-3D	1279805.3346	494476.5841	8.87
241	MD75MW15	1279801.3977	494479.2818	9.08
242	Ground Shot	1279803.6709	494478.2044	9.28
243	MD75MW05	1280007.5597	494465.0305	9.48
244	Ground Shot	1280009.2374	494466.9928	9.62
245	75SS-4 Ground Shot	1280029.2598	494442.1656	9.61
246	MD75MW07	1279909.6516	494461.9729	9.07
247	Ground Shot	1279908.5968	494462.8221	9.30
248	MD75MW06	1279914.4972	494490.5571	9.12
249	Ground Shot	1279914.1418	494492.6904	9.18
250	Building Comer.N.W.	1279934.1590	494513.9606	9.48
251	Building Corner.N.E.	1279957.6492	494537.6885	9.70
252	Building Comer	1279839.1522	494655.7609	9.72
253	Building Corner	1279814.4685	494631.0392	9.64

Prepared by: Landmark Engineering & Surveying Corporation

For: PARSONS ENGINEERING SCIENCE, INC.

Sheet 6 of 6

APPENDIX C LABORATORY ANALYTICAL DATA

022/722450/203.WW6



Ref: 95/JAD21

April 20, 1995

Dr. Don Kampbell

R.S. Kerr Environmental Research Lab

U.S. Environmental Protection Agency

P.O. Box 1198 Ada, OK 74820

THRU: S.A. Vandegrift

-MacDill data also included & MacDill AFB

Dear Don:

As requested in Service Request # SF-1-123, headspace GC/MS analysis of 90 Patrick AFB water samples for chlorinated VOAs (TCE, PCE, DCE's, and vinyl chloride) was completed. The samples were received on March 28 & April 6, 1995 and analyzed on April 6-11, 1995. RSKSOP-148 (Determination of Volatile Organic Compounds in Water by Automated Headspace Gas Chromatography/Mass Spectrometry (Saturn II Ion Trap Detector) was used for this analysis.

An internal standard calibration method was established for 6 chlorinated compounds. In standard curves were prepared from 1.0 to 5000 ppb. The lower calibration limits were 1.0 ppb.

A dilution corrected quantitation report for the samples, lab duplicates, field duplicates, QC standards and lab blanks is presented in tables 1-4.

If you should have any questions, please feel free to contact me.

John Allen Daniel

xc: R.L. Cosby

G.B. Smith

D.D. Fine

J.L. Seeley

ManTech Environmental Research Services Corporation

Table 1. Quantitation Report for S.R. # SF-1-123 from Patrick AFB.

Concentration = ppb

WWY CHLORIDE ND 207 Lab Dup Field Rep ND	ND ND ND ND ND ND ND ND ND ND ND ND ND N	0	Fleid Rep 20.8 ND ND 6.2 ND 1.0 1.0 ND ND ND ND ND ND ND	ON ON ON ON ON ON ON ON ON ON ON ON ON O	24 AMP - 8D ON ON ON ON ON ON ON ON ON ON ON ON ON	24MP - 8S	24MP - 9D ND ND ND ND ND ND ND ND ND ND ND ND ND N	24 ND ND ND ND ND ND ND ND ND ND ND ND ND	24 A A A A A A A A A A A A A A A A A A A
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NO	24MP-5S 24MP-6S ND ND ND ND ND ND ND ND ND ND ND ND ND		ND 6.2 ND 1.0 1.0 ND ND ND ND ND ND ND ND	AMP-75 ND ND ND ND ND ND ND ND ND ND ND ND ND N	24 MP - 80 O N O O O O O O O O O O O O O O O O O O	24MP - 8S	24MP – 9D ND ND ND ND ND ND ND ND ND ND ND ND ND	24MP - 9S N N N N N N N N N N N N N N N N N N N	24MP - 100 ON ON ON ON ON ON ON ON ON ON ON ON ON O
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Table 2. Quantitation Report for S.R. # SF-1-123 from Patrick AFB.

Concentration = ppb

MU24-41 MW32-1		MW7					1/5 DII	Field Rep
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56MP-5D 56MP-5S ND ND ND ND ND ND ND ND ND ND ND ND ND ND ND ND ND ND	S6MP - 6D ND ND ND ND ND ND	S6MP – 6D Lab Dup ND ND ND ND ND ND ND ND	S6MP – 6S ND ND ND ND ND ND	S6MP – 7D ND ND ND ND ND ND ND ND ND ND ND ND ND	S6MP - 7S ND ND ND ND ND ND ND ND ND ND ND ND ND N	S6MP - 8S ND ND ND ND ND ND ND	S6MP - 10S ND ND ND ND ND ND	S6MP - 15D ND ND ND ND ND ND
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MW56-7 MW56-8 ND ND ND ND ND ND ND ND ND ND ND ND ND ND ND ND ND ND ND ND ND ND ND ND ND	MW56-9 ND ND ND ND ND ND ND ND ND ND ND ND	9 00000	MW56-11 ND ND ND ND ND ND ND ND ND	4	4 00000	75MP – 3D ND ND ND ND ND ND ND ND	ASMP - 4S ND ND ND ND ND ND ND ND	75MP - 5D ND ND ND ND ND ND ND ND ND
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Table 3. Quantitation Report for S.R. # SF-1-123 from Patrick AFB.

Concentration = ppb

Compound	75MP - 5D	75MP-6D	75MP-7D	75MP-70	75MP-7S	75MP-8D	75MP-8S	75MP-8S	75MP-9D	75MP-9S
10000	מפוט פול	•		רמט טטט	!	!		dod pier		
MAYLCHIOHIDE	Q	2	2	2	2	2	2	2	2	9
1,1-DICHLOROETHENE	2	2	2	2	2	2	2	2	2	2
T-1.2-DICHLOROETHENE	QN	S	S	S	S	S	Ç	Š	S	S
CL12LOGOHODE	2	2	2	2	2	2 2	2 2	2 2	2 2	2 2
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INCHCOCOETHENE	2	2	2	2	2	2	2	2	2	2
TETRACHLOROETHENE	Q	2	Q	2	Q	Q	9	9	2	Q
	MD75-	M075_	MD75_	M075_	M075_	MD75_	MD75_	MOZE	MD75	MD78
	MW/2	MAZ			200	MAIAIE	200	200		
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	2 !	!	•	Laboup	deuniel	!	ı			
VINYLCHLORIDE	2	2	2	2	2	2	2	2	2	2
1,1-DICHLOROETHENE	2	2	2	2	2	2	2	2	2	Q
T-1,2-DICHLOROETHENE	2	2	2	Q	Q	2	Q	2	S	S
C-12-DICHLOROETHENE	Q	Q	Q	S	S	S	S	Ş	Ş	Z
TANAL PROPERTY	2	<u> </u>	2	2	2	2	2 2	2	2 2	
	2	2	2	2	S	2	2	Ž	2	2
TETRACHLOROETHENE		2	Q	2	2	2	2	Q	Q N	2
	MD75-	MD75-	MD75-	MD75-	MD75-	MD75-	MD75-	MD75-	MD75-	Trip Blank
	MW10	MW11	MW12	MW13	WW14	MW14	MW14	MW15	MW16	i L
						Lab Duo	FieldRen)	
MNYLCHLORIDE	S	Š	CZ	Ş	S		5	2	2	Ş
	2 2	2 9	2 2	2 4	2 4	2 5	2 :	2 5	2 :	2 :
	2	S	2	2	2	2	2	2	2	2
T-1,2-DICHLOROETHENE	2	2	2	2	9	2	9	2	2	Q
C-1,2-DICHLOROETHENE	Q	2	Q	8	1.0		0.1	2	9	2
TRICHLOROETHENE	Q	2	Q	9	Q	9	Q	2	2	Q
TETRACHLOROETHENE	Q	Q	Q	Q	Q	ð	Q	₽ Q	S	Q
			•							
	QC0406A	QC 0406B	OC0406C	OC0406D	OC0406E	OC0406F	OC0406G	OC0406H	OC 04084	OC0408B
•	20 ppp	200 ppp	20 pp	200 pph	20 nnh	200 pph	SO DO	200 ppp	20 och	200 000
ANY CHI ORIDE	20.8	196	20.7	108) 1 0	107	244	200	000	200
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	50.3	88	ה ה	/61	Δ. 4.	20 25 26	18.7	96	19.1	196
1-1,2-DICHLOROETHENE	19.4	185	19.5	180	18.2	186	19.0	187	18.7	192
C-1,2-DICHLOR OETHENE	19.2	196	20.2	196	19.5	187	20.4	198	20.8	201
TRICHLOROETHENE	21.2	210	22.1	210	19.9	214	21.1	208	21.3	213
TETRACHLOROETHENE	19.9	195	19.0	197	18.8	193	18.8	194	18.2	190
<i>''</i>									1	!
ND = None Detected	1 1 B6	= Below Calibation	bation Limit(1.0 ppb)		QC = Quality Control Std		Dup = Duplicate	Rep = Replicate	ate	

--- = Below Calibation Limit(1.0 ppb) QC = Quality Control Std Dup = Duplicate Rep = Replicate

Table 4. Quantitation Report for S.R. # SF-1-123 from Patrick AFB.

Concentration = ppb

Compound	ပ္က	QC0408D	QC0408E	QC0408F	QC 04 10A	QC 04 10B	QC0410C	QC0410D	QC0410E	BL0406A
	_	200 ppp	20 ppp	200 ppp	20 ppb	200 ppb	20 ppp	200 ppp	20 ppp	
MNYLCHLORIDE	20.9	198	21.0	188	21	191	19.2	194	20.9	Q
1,1-DICHLOROETHENE		200	19.7	1 8 6	19.8	189	19.1	200	200	S
T-1,2-DICHLOROETHENE	19.0	189	19.2	181	18.6	181	19.6	192	161	Ž
C-1,2-DICHLOROETHENE	19.8	203	19.0	193	19.2	194	19.9	199	19.3	S
TRICHLOROETHENE	20.4	214	20.8	506	21.3	203	20.6	212	21.8	S
TETRACHLOROETHENE	19.0	196	18.7	186	19.3	187	19.5	198	19.9	2
	BL04068	BL0408A	BL0410A							
MNYLCHLORIDE	QN	Q	2							
1,1-DICHLOROETHENE	2	Q	Q							
T~1,2~DICHLOROETHENE	9	Q	2							
C-1,2-DICHLOROETHENE	2	Q	2							
TRICHLOROETHENE	2	Q	2							
TETRACHLOROETHENE	ON.	Q	Q							

QC = Quality Control Std BL = Blank ND = None Detected



Ref: 95-JH29/vg

May 9, 1995

Dr. Don Kampbell

R.S. Kerr Environmental Research Lab U.S. Environmental Protection Agency

P.O. Box 1198

Ada, OK 74820

THRU: S.A. Vandegrift

Dear Don:

MacD.11

Find attached results for methane and ethylene on Patrick AFB samples as per Service Request #SF-1-123. Samples were received on 3/27, 3/28, and 4/6 and analyzed on 3/27, 3/28, 3/30, 4/3, 4/4, 4/7, 4/10, and 4/11/95. Samples were prepared and calculations were done as per RSKSOP-175. Analysis was performed as per RSKSOP-147.

If you have any questions, please feel free to see me.

Sincerely,

Jeff Hickerson

xc: R.L. Cosby

J.L. Seeley

ANALYZED 3/27/95 SAMPLE	METHANE	ETHYLENE
LAB BLANK	BLQ	ND
28	12.846	ND
* FIELD DUP	14.150	ND
3D	2.570	ND
3M	12.437	ND
3S	15.534	ND
86-16DD	0.074	ND
90	9.839	ND
98	5.822	ND
120	0.882	ND
125	12.339	ND
260	3.756	ND
268	9.009	ND
86-18D	6.116	ND
ANALYZED 3/28/95		
SAMPLE	METHANE	ETHYLENE
LAB BLANK	BLQ	ND
86-21-MWD	0.749	ND
86MW-10D	1.598	ND
" FIELD DUP	1.560	ND
86MW-18S	3.379	ND
"LAB DUP	3.178	ND
86-18DD	0.068	ND
86-MW4D	5.095	ND
86-MW4S	11.630	ND
" LAB DUP	10.594	ND
86-21-MWS	9.857	ND
ANALYZED 3/30/95		
SAMPLE	METHANE	ETHYLENE
•		
LAB BLANK	BLQ	ND
24PZ-1\$	4.177	ND
24MP-2\$	9.887	ND
24MP-3D	0.182	ND
MD32-3	0.137	ND
MD24-4	0.266	ND
"LAB DUP	0.261	ND
MW56-6	6.324	ND
56-MP-6S	0.245	ND
24MP-7S	0.045	ND
56MP-7D	0.067	ND
MW56-8	2.298	ND
24MP-8D	0.068	ND
MD24-9	0.146	ND
24MP-1S	2.501	BLQ

ANALYZED 3/30/95		
SAMPLE	METHANE	ETHYLENE
24MP-1D	1.788	ND
24MP-2D	0.145	ND
MP24-4	0.288	ND
"LAB DUP	0.271	ND
ANALYZED 4/3/95		
SAMPLE	METHANE	ETHYLENE
LAB BLANK	BLQ	ND
24PZ-1D	0.137	ND
MD56-MW9	0.739	ND
56MP-4S	8.968	ND
56MP-5D	0.568	ND
56MP-5S	13.574	ND
56MP-6D	0.086	ND
56MP-8S	0.032	ND
56MP-10S	2.288	-
*LAB DUP		ND
56MP-15D	2.081 0.548	ND
		ND
MD24-1 MD24-2	0.573	ND ND
	1.311	ND
MD24-3	0.242	ND
MD24-5	0.217	ND
MD24-6	0.610	ND
MD24-6A	2.335	0.001
MD24-7	0.429	ND
ANALYZED 4/4/95		
SAMPLE	METHANE	ETHYLENE
LAB BLANK	BLQ	ND
MD24-7 FIELD DUP	0.048	ND
MD24-8	0.578	ND
MD24-10	0.249	ND
MD24-10A	0.749	ND
24MP-3S	0.970	ND
24MP-5D	0.075	ND
24MP-5S	0.065	ND
24MP-6S	1.045	ND
24MP-7D	0.033	ND
" LAB DUP	0.032	ND
24MP-8S	0.125	ND
24MP-9D	0.053	ND
24MP-9S	3.270	ND
24MP-10	0.696	ND
24MP-10D	0.060	ND
MW56-1	0.442	ND
MW56-2	0.492	ND

ANALYZED 4/4/95 SAMPLE	METHANE	ETHYLENE
10050 10		
MW56-10 *LAB DUP	3.711	ND
MW56-12	3.513	ND
MMA20-12	0.014	ND
ANALYZED 4/7/95		
SAMPLE	METHANE	ETHYLENE
LAB BLANK	BLQ	ND
56MW-1	0.087	ND ND
MW56-5	0.136	ND
MW56-7	7.953	ND
MW56-11	5.279	ND
56MP-1S	0.161	ND
56MP-2S	0.101	ND
56MP-3D	1.069	ND
56MP-3S	0.092	ND
56MP-7D	0.035	ND
MD32-MW7	4.749	ND
"LAB DUP	4.545	ND
441412755 4145155		
ANALYZED 4/10/95		
SAMPLE	METHANE	ETHYLENE
LAB BLANK	BLQ	ND
MD56-MW4	0.034	ND
MW32-1	2.634	ND
MD75-MW2	0.271	ND
MD75-MW3	0.038	ND
MD75-MW4	1.890	BLQ
MD75-MW5	0.035	ND
MD75-MW9	2.245	ND
MD75-MW6	2.466	ND
"LAB DUP	2.351	ND
MD75-MW7	0.641	ND
MD75-MW8	8.962	ND
MD75-MW10	5.394	ND
MD75-MW11	0.986	ND
MD75-MW12	7.310	ND
MD75-MW13	1.227	ND
MD75-MW14	15.439	ND:
MD75-MW15	0.050	ND
MD75-MW16	6.039	ND
75MP-2S	6.550	0.001
"LAB DUP	6.215	ND

ANALYZED 4/11/95		
SAMPLE	METHANE	ETHYLENE
LAB BLANK	BLQ	ND
75MP-3D	1.777	ND
" FIELD DUP	0.036	ND
75MP-4S	14.469	0.001
75MP-5D	7.361	ND
75MP-6D	8.613	ND
75MP-7D	0.437	ND
75MP-8D	0.038	CN
75MP-8S	0.042	ND
" LAB DUP	0.041	ND
75MP-9D	0.072	ND
75MP-9S	0.132	ND
75MP-28\$	0.043	ND
STANDARDS		
SAMPLE	METHANE	ETHYLENE
10 PPM CH4	9.71	ND
100 PPM CH4	100.03	ND
1000 PPM CH4	1044.51	ND
1% CH4	1.01	ND
10% CH4	9.63	ND
20% CH4	20.18	ND
10 PPM C2H4	ND	9.95
100 PPM C2H4	ND	100.00

LOWER LIMIT OF QUANTITATION

METHANE ETHYLENE

ND

0.001 0.003

999.62

UNITS FOR THE SAMPLES ARE mg/L.

1000 PPM C2H4

UNITS FOR THE STANDARDS CORRESPOND TO THE UNITS IN THE SAMPLE COLUMN.

ND DENOTES NONE DETECTED.
BLQ DENOTES BELOW LIMIT OF QUANTITATION.

I would round off the reported values to two significan digits. Boy Kanglell

vergreen Analytical Sample Log Sheet

Project # <u>95-0871</u>

Custodian/Date: 433 (x)

ate(s) Sampled: 03/13-15/95	Date Due: 03/22/95-U: 03/31/95-O	
e Received: 03/17/95 1030	Holding Time(s): 03/27-29-BTEX	TVH, TE
lient Project I.D. 722450.2	1020/MacDILL AFB Rush STAND	ARD
lient: Parsons Engineering S	cience, Inc. Shipping Charges N/A	
ddress: 1700 Broadway Suite	900 E.A. Cooler # 602	
Denver, CO 80290	Airbill # FEDEX 9581826	192
ontact: TODD WIEDEMEIER	Custody Seal Intact?	Y
11:	Cooler X Bottles COC Present	_Y
lient P.O. 722450.21020	Sample Tags Present?	Ŷ
hone #831-8150 Fax #831	-8208 Sample Tags Listed?	Y Y
	Sample(s) Sealed?	1
pecial Instructions *PLUS CH	LOROBENZENE, TEMB & TMB. REPORT ALL SOILS	S ON A
	ANMS/MSD AND DUPLICATE ON THIS CLIENT'S S	AMPLES.
ab Client D# ID#	Analysis Mtx Btl Loc	
<u> </u>		
04339A/B 75MP-2(2-4)	*BTEX S 2WM 2	
04340A/B 75MP-2(8-10)	*BTEX S 2WM 2	
341A/B 75SS-3 (3-4)	*BTEX S 2WM 2	
.4342A/B 75SS-3(8-10)	*BTEX S 2WM 2	
04344A/B 75MP-3(3-5)	*BTEX S 2WM 2	
04345A/B 75MP-4(8-10)	*BTEX (% MOISTURE) S 2WM 2	
04346A/B 75MP-4(13-15)	*BTEX (% MOISTURE) S 2WM 2	
04347A/B 75MP-5(4-6)	*BTEX S 2WM 2	
04348A/B 75MP-5(6-8)	*BTEX (% MOISTURE) S 2WM 2	
04349A/B 75SS-15(4-6)	*BTEX (% MOISTURE) S 2WM 2	
	*BIEX (& MOISIURE) S ZHM Z	
04350A/B 75SS-6(3-5)	*BTEX (* MOISTURE) S 2WM 2	
04350A/B 75SS-6(3-5)		
04350A/B 75SS-6(3-5) 04353A/B 75SD-1	*BTEX S 2WM 2 *BTEX (% MOISTURE) S 2WM 2	
04350A/B 75SS-6(3-5) 04353A/B 75SD-1 04354A/B 75SD-2	*BTEX S 2WM 2 *BTEX (% MOISTURE) S 2WM 2 *BTEX (% MOISTURE) S 2WM 2	
04350A/B 75SS-6(3-5) 04353A/B 75SD-1 04354A/B 75SD-2 04355A/B 75SD-3	*BTEX S 2WM 2 *BTEX (% MOISTURE) S 2WM 2 *BTEX (% MOISTURE) S 2WM 2 *BTEX (% MOISTURE) S 2WM 2	
04350A/B 75SS-6(3-5) 04353A/B 75SD-1 04354A/B 75SD-2 04355A/B 75SD-3 04356A/B 75SD-4	*BTEX S 2WM 2 *BTEX (% MOISTURE) S 2WM 2 *BTEX (% MOISTURE) S 2WM 2 *BTEX (% MOISTURE) S 2WM 2 *BTEX (% MOISTURE) S 2WM 2	
04350A/B 75SS-6(3-5) 04353A/B 75SD-1 04354A/B 75SD-2 04355A/B 75SD-3 04356A/B 75SD-4 04360A/B 75MP-7(6-8)	*BTEX S 2WM 2 *BTEX (% MOISTURE) S 2WM 2 *BTEX (% MOISTURE) S 2WM 2 *BTEX (% MOISTURE) S 2WM 2 *BTEX (% MOISTURE) S 2WM 2 *BTEX (% MOISTURE) S 2WM 2 *BTEX (% MOISTURE) S 2WM 2	
75SS-6(3-5) 75SD-1 75SD-2 75SD-3 75SD-3 75SD-4 75SD-4 75SD-4 75SD-4 75SD-7(6-8) 75SD-7	*BTEX S 2WM 2 *BTEX (% MOISTURE) S 2WM 2 *BTEX (% MOISTURE) S 2WM 2 *BTEX (% MOISTURE) S 2WM 2 *BTEX (% MOISTURE) S 2WM 2 *BTEX (% MOISTURE) S 2WM 2 *BTEX (% MOISTURE) S 2WM 2 *BTEX (% MOISTURE) S 2WM 2	
04350A/B 75SS-6(3-5) 04353A/B 75SD-1 04354A/B 75SD-2 04355A/B 75SD-3 04356A/B 75SD-4 04360A/B 75MP-7(6-8) 04357A/B 75SW-1 04361A TRIP BLANK	*BTEX S 2WM 2 *BTEX (% MOISTURE) S 2WM 2 *BTEX (% MOISTURE) S 2WM 2 *BTEX (% MOISTURE) S 2WM 2 *BTEX (% MOISTURE) S 2WM 2 *BTEX (% MOISTURE) S 2WM 2 *BTEX (% MOISTURE) S 2WM 2 *BTEX W 40V 2 *BTEX W 40V 2	
75SS-6(3-5) 75SD-1 75SD-2 75SD-3 75SD-3 75SD-4 75SD-4 75SD-4 75SD-4 75SD-7(6-8) 75SD-7	*BTEX S 2WM 2 *BTEX (% MOISTURE) S 2WM 2 *BTEX (% MOISTURE) S 2WM 2 *BTEX (% MOISTURE) S 2WM 2 *BTEX (% MOISTURE) S 2WM 2 *BTEX (% MOISTURE) S 2WM 2 *BTEX W 40V 2 *BTEX W 40V 2 *BTEX W 40V 2 *BTEX,TVH S 2WM 2	

Page 1 of 2 Page(s)

Lab ID#	Client ID#	Analysis	Mtx	Btl	Loc
X04339C	75MP-2(2-4)	TVH	s	2WM	2
X04340C	75MP-2(8-10)	TVH	s	2WM	2
(04341C	75SS-3(3-4)	TVH	S	2WM	2
(04342C	7588-3 (8-10)	TVH	s	2WM	2
(04344C	75MP-3(3-5)	TVH	s	2WM	2
(04345C	75MP-4(8-10)	TVH	s	2WM	2
(04346B	75MP-4(13-15)	TVH	s	2WM	2
(04347C	75MP-5(4-6)	TVH	s	2WM	2
04348C	75MP-5(6-8)	TVH	S	2WM	2
(04349C	75SS-15(4-6)	TVH	S	2WM	2
(04350C	75SS-6(3-5)	TVH	S_	2WM	2
(04353C	75SD-1	TVH	s	2WM	2
04354C	75SD-2	TVH	S	2WM	22
(04355C	75SD-3	TVH	S	2WM	2
04360C	75MP-7(6-8)	TVH	S	2WM	2
04339D	75MP-2(2-4)	тен	S	2WM	B7
04340D	75MP-2(8-10)	ТЕН	s	2WM	B7
04341D	75SS-3(3-4)	TEH	S	2WM	B7
04342D	75SS-3(8-10)	TEH	S	2WM	B7
(04344D	75MP-3(3-5)	TEH	s	2WM	B7
04347D	75MP-5(4-6)	TEH	S	2WM	B7
(04349D	75SS-15(4-6)	TEH	S	2WM	B7
04350D	75SS-6(3-5)	<u>TEH</u>	S	2WM	B7
(04351B	75SS-6(7-9)	тен	s	2WM	B7
04339E	75MP-2(2-4)	% MOISTURE	s	4 WM	B7
04340E	75MP-2(8-10)	% MOISTURE	S	4WM	B7
04341E	75SS-3(3-4)	% MOISTURE	s	4 WM	В7
04342E	75SS-3(8-10)	% MOISTURE	s	4WM	B7
04344E	75MP-3(3-5)	% MOISTURE	S	4 WM	B7
04347E	75MP-5 (4-6)	% MOISTURE	<u>s</u>	4WM	B7
04350E	75SS-6(3-5)	% MOISTURE	s	4WM	B7
04351C	75SS-6(7-9)	% MOISTURE	S	TUBE	B7
(04343A	75SS-4 (3-4)	TOC(% MOISTURE) s	2WM	OUT
04350F	75SS-6(7-9)	TOC	s	2WM	OUT
04358A	75MP-7(4-6)	TOC	S	2WM	OUT
04359A	75MP-17(4-6)	TOC	S	2WM	OUT

Page 2 of 2 Pages Project # 95-0871

R=Sample to be returned

ID #	Client ID#	Analysis	Mtx	Btl	Loc
X04339C	75MP-2(2-4)	TVH	S	2WM	2
304340C	75MP-2(8-10)	TVH	S	2WM	2
1 4341C	75SS-3 (3-4)	TVH	S	2WM	2
X04342C	75SS-3(8-10)	TVH	S	2WM	2
X04344C	75MP-3(3-5)	TVH	S	2WM	2
X04345C	75MP-4(8-10)	TVH	s	2WM	2
X04346B	75MP-4(13-15)	TVH	s	2WM	22
X04347C	75MP-5(4-6)	TVH	s	2WM	2
X04348C	75MP-5(6-8)	TVH	S	2WM	2
X04349C	75SS-15(4-6)	TVH	s	2WM	_2
X04350C	75SS-6(3-5)	TVH	s	2WM	2
X04353C	75SD-1	TVH	S	2WM	
X04354C	75SD-2	TVH	S	2WM	2
X04355C	75SD-3	TVH	S	2WM	2
X04360C	75MP-7(6-8)	TVH	S	2WM	2
X04339D	75MP-2(2-4)	TEH	S	2WM	В7
X04340D	75MP-2(8-10)	TEH	S	2WM	B7
X04341D	75SS-3 (3-4)	TEH	s	2WM_	B7
104342D	75SS-3(8-10)	TEH	s	2WM	B7
. ¶344D	75MP-3 (3-5)	ТЕН	s	2WM	
X04347D	75MP-5(4-6)	TEH	s	2WM_	B7
X04349D	75SS-15(4-6)	TEH	s	2WM	B7
X04350D	75SS-6(3-5)	TEH	s	2WM	B7
X04351B	75SS-6(7-9)	TEH	s	2WM	B7
X04339E	75MP-2(2-4)	% MOISTURE	s	4WM	В7
X04340E	75MP-2(8-10)	% MOISTURE	s	4WM	B7
X04341E	75SS-3(3-4)	% MOISTURE	s	4 WM	B7
X04342E	75SS-3(8-10)	% MOISTURE	s	4WM	B7
X04344E	75MP-3(3-5)	% MOISTURE	s	4WM	В7
X04347E	75MP-5(4-6)	% MOISTURE	S	4WM	B7
X04350E	75SS-6 (3-5)	% MOISTURE	s	4WM	B7
X04351C	75SS-6(7-9)	% MOISTURE	S	TUBE	B7
X04343A	75SS-4 (3-4)	TOC(% MOISTURE)	s	2WM	OUT
X04350F	75SS-6(7-9)	TOC	S	2WM	OUT
X04358A	75MP-7(4-6)	TOC	s	2WM	OUT
Y 358B	75MP-7 (4-6) METHOD	BLANK TOC	s	2WM	OUT
λ.,359A	75MP-17(4-6)	TOC	s	2WM	OUT

Page 2 of 2 Pages Project # 95-0871

R=Sample to be returned

UNIT OF CUSIOUY RECORD / ANALYTICAL SERVICES REQUEST

390)		1	(Yest)		-				Instructions:
Container Size 40V 2W									DD:
Location 287		フリ	14/p				· .		HT
- CO-		ア 火	Σ		×		1607 3	3-44-66	45mp-5(6.2)
47	×	×	<u>ک</u>		<u>ل</u> ا		1600 E	3-14-15	: 1 smo- s(4-6)
9h		x 8 x	X X		- - - - - - - - -		1515	3-11-5-	751MP-4(13-6.)
+	B	*	×			*	1445 B	3-1-1-53-	15mp-4(8-10)
王	+	×	×		X		1345 5	3-14-65	75MP-3(3-5)
43	× A				×	\	्व।	3-14-75	7555-4 (3.4)
2h	14	レメ	\\ \rightarrow \ri		¥	7	34	 	7555.3 (8-10)
3	×	×	<i>X</i>		:2	×	1630		7508-33-4)
40	У	х У	X		· •	<u>ک</u>	5 0041	3-13-85	751711-21810)
x04334	×	X	メ		 - ×		1245	3-13-91	75mP-2(2-4)
EAL Sample No.	Total Meta (circle & liss Dissolved (circle & liss M.c. (circle & liss	BTEX 8020 TRPH 418.1 TVPH 801 TSPH 801	Herbicides	TCLP VOA VOA 8260/ BNA 8270/ Pesticides	Oil / Sludge	No. of Con Water-Dnn (circle) Soil / Solid	TIME	DATE SAMPLED	CLIENT SAMPLE IDENTIFICATION
Custodian M. K.	Siem is	boma 5	0808 s	9/828/	θ) יצוט6⁄ב		ation;	all information;
EAL 75:087	S - DW /	Grease 4	1508/508/ 1515 (cir	24.2 (cir				NIXT	Please PRIN
		3.1 (circle	(circle)	(ə)c		onuo12/6			Evergreen Analytical Cooler No. Cooler Received
in shaded area	Party I	48-6-			+	<u></u>	455	107	2
EAL use only	REQUESTED	ANALYSIS REC	AN		MATRIX	MA	L		(signature)
expedited turnaround subject to additional fee	*expedited turnaroun)	The Property of the Property o	2508		ı			Sampler Name:
	TURNAROUND REQUIRED	Z () SI	(800) 845-7400 FAX RESULT	COLUMN TO THE PARTY OF THE PART	-)5/	FAX	1		× ×
PO. 722450, 2135	EAL. QUOTE #	-6854	FAX (303) 425-6854	<		ر د ا	10408, 915	1	71.11
Mac D. 11 (AFB	CLIENT CONTACT (print) PROJECT I.D. Moc.	4036 Tobrigheid St. Wheat Ridge, Colorado 80033 (303) 425-6021	Wheat Ridge, Colo (303) 425-6021	~ ({		300	7	Branchory	ADDRESS (700 BS)
Page Lot S		cal Inc.	Evergreen Analytical Inc.	Evergre					(-
_	, , , , , , , , , , , , , , , , , , , ,								

Comme (3) Jakold (3) Same

Cate Time Size HOU, TWIM PO# 722452 702 128-56 Do not write in shaded area 781 me EAL Sample No. rage 2 of EAL use only 30 5 40 434a かな \mathcal{S}' 55 CLIENT CONTACT (print) 1 - Welleng Custodian. Project # Container expedited turnaround subject to additional fee Location Date/Time | Received by (Signature) PROJECT 10 Mach, 11 MER TURNAROUND REQUIRED. EAL. QUOTE #_ 201 であり 1 X たのた Moistur REQUESTED Jolai Metais-DW / NPDES / SW846 (circle & list metais below)
(circle & list metais below) 17 × 3-75-95 Date/Time Relinquished by: (Signature) IEPH 8015mod. (Diesel) Wheal Fildge, Colorado 80033 (303) 425-6021 FAX (303) 425-6854 (800) 845-7400 × TVPH 8015mod. (Gasoline) z Evergrees analytical Inc. ANALYSIS 7RPH 418.1/Oil & Grease 413.1 (circle) **∕** ≻ × × Y an original × × × 4 5 BTEX 8020/602 (Circle).MTBE (circle) 4036 Youngfield St FAX RESULTS × × × Х × ¥ X Herbicides 8150/515 (circle) Pest/PCBs 8080/608/508 (circle) 1 Set Pesticides 8080/608 (circle) BNA 8270/625 (circle) TXT VOA 8260/624/524.2 (circle) CLP VOAVBNA/Pest/Herb/Metals Date/Time Receised by: (Signature) MATRIX egbul2 \ iiO × 2-6 × X Y Waler-Dnnking/Discharge/Ground C1250 8 912 FAX * 7-5857 स्ता अ No. of Containers ৩ 3-25-46 1505 3 30-15 1455 3 17.43 3051/205 3.11-15 1325 13-15-95 1430 25-98 1515 (88) TIME 7555-6 (3-5) 311-95 11315 3/14/9/ 229 7535-15(40)|3-14-55 SAMPLED ġ ナンイン C. Cade Evergreen Analytical Cooler No DATE 2000 STATE CO. Please PRIN all information: ions ES ď, 755.6 (74) 45-25-6(22-24) DENTIFICATION AUDRESS (Pto OIT CREWEN PHONE# 363 SAMPLE ナ 7550-3 CLIENT Sampler Narke こんかん Cooler Received 1550 550 7550 Instructions de (signature)

COCOLOTI SECOND / ANALT SICAL SERVICES REGUES!

CHAIN OF CUSTODY RECORD / ANALYTICAL SERVICES REQUEST

Page 3 of S CLIENT CONTACT (pnnt) S to be the the title PROJECT (D) FT (WC.C.) (I) EAL. GUOTE # P.O.* F27 (C. 2 (c. 2) TURNAROUND REQUIRED: expedited turnaround subject to additional fee	EAL use only . Do not write	in shaded area EAL Custodian MM EAL Custodian MM EAL Custodian MM EAL Custodian MM EAL Custodian MM EAL Custodian MM EAL Custodian MM EAL Custodian MM EAL Custodian MM EAL Custodian MM EAL Custodian MM EAL Custodian MM EAL Custodian MM EAL Custodian MM EAL Custodian MM EAL EAL Custodian MM EAL EAL Custodian MM EAL EAL EAL Custodian MM EAL EAL EAL EAL EAL EAL EAL Custodian MM EAL EAL EAL EAL EAL EAL EAL E	7	8	09	19	X.	notused	16.59.		Location 7 137	1 13	
. (033	ANALYSIS REQUESTED	CICICLE & IST MERISIS DEIOW) DISSOINCE SIST MERISIS DEIOW) TORIA MERISIS DEIOW) PREX 8020/602 (CICICLE) TORIA MERISIS DEIOW) TORIA MERISIS DEIOW) PREX 8020/602 (CICICLE)/MTBE (CICICLE) PREX 8020/603 (CICICLE)/MTBE (CICICLE) TORIA MERISIS DEIOW) PREX 8020/603 (CICICLE) PREX 8020/603 (CICICLE) TORIA MERISIS DEIOW TORIA MERISIS DEIOW) TORIA MERISIS DEIOW TORIA	X	A B AX	× 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	X TUBIT	4						
1 1 1 ± ±'	MATRIX	Valer-Dnnking/Discharge/Dround (چنرچانه) Solid Solid فالمواه	У	×	×	×							
CUMPANY POUSINS ES ADURESS POU BOEN. EUCH SLE (120) CITY DE LOUIS STATE CO ZIP XOLE (180) PHONE & S. S. (160) Sampler Name: Control of Control	(print) Sylle (- (21,100)	Evergreen Analytical Cooler No. Grace Cooler Received. Please PRINT Please all information: CLIENT SAMPLE DATE DOTE DENTIFICATION SAMPLED TIME 2	75 542-7(193-10-45 170 3	7 Salp-17 (15) 3-11-95 1830 11	3) 3-11-91	11.0 8(ant 3-6 45 1130 1					11:	CD:	Instructions:

Drongleen Analytical Sample Receipt	
Date & Time Rec'd: 3-17-95 /600 Shipped	d Via: FCGCX (Airbill # if applicable)
client: Farsons ES	(AlfBill # II applicable)
Client Project ID(s): MacDill AFB	
EAL Project $\#(s):95-O$71$ EAL	L Cooler(s):
Cooler# <u>602</u>	
Ice packs (Y) N Y N Y N	Y N Y N
Temperature ℃ <u>Y*C</u>	
	Y N N/A
1. Custody seal(s) present: Seals on cooler intact Seals on bottle intact	
2. Chain of Custody present:	
3. Containers broken or leaking: (Comment on COC if Y)	
4. Containers labeled:	<u>×</u>
5. COC agrees w/ bottles received: (Comment on COC if N)	
<pre>6. COC agrees w/ labels: (Comment on COC if N)</pre>	<u>×</u>
7. Headspace in VOA vials-waters only (comment on COC if Y)	<u>×</u>
8. VOA samples preserved:	
9. pH measured on metals, cyanide or phenolicList discrepancies*Non-EAL provided containers only, water	
10. Metal samples present:	
Total, Dissolved	·
D or PD to be filtered: T,TR,D,PD to be Preserved:	
11. Short holding times: Specify parameters	
12. Multi-phase sample(s) present:	<u>×</u>
13. COC signed w/ date/time:	<u> </u>
Comments:	
7	<i></i>
(Additional comments on back) Custodian Signature/Date:	2-17-85

CHAIN OF CUSTODY RECORD / ANALYTICAL SERVICES REQUEST

Sumpler Name: Sumpler Name: Sumpler Name: Sumpler Name: Sumpler Name: Sumpler Name: Sumpler Name: Sumpler Name: Sumpler Name: Sumpler Name: Cooler No. Containers Please PRINT Please PRINT Sample DATE IDENTIFICATION SAMPLED TIME OF SUMPLICIONERS BUSINGES BISINGES Herbicides 8150/6-10 Sumpler Name: Sumple	ANALYSIS REQU	E.A.L. GUOTE # P.O.#. TURNAROUND REQUIRED: ***PARAMETER FOR STATES AND THE STAT	
BINA 8270/625 (circle) Coil / Solid Soli / Solid Water-Drinking/Discharge/Ground Water-Drinking/Discharge/Ground Oil / Sludge Water-Drinking/Discharge/Ground Oil / Sludge VoA 8260/624 (circle) SampleD TIME Pesticides 8080/608 (circle)	ANALY SIS	OVINCE OF THE PROPERTY OF THE	P.O. + 724.30, C156
TCLP VOA/BNAVPest/Herb/Metals Soil / Solid No. of Containers Nater-Drinking/Discharge/Ground (circle) VOA 8260/624/524.2 (circle) Soil / Solid Soil / Solid Soil / Solid Pesticides 8080/608 (circle) Pesticides 8080/608 (circle)	ANALY SI S (Circle)		9
The DATE ATION SAMPLED TIME AND SECONDS (circle) BNA 8270/625 (circle) BNA 8270/625 (circle) Pesticides 8080/608 (circle) Pesticides 8080/608 (circle)	9) E (circle) 1 (circle)	TED	EAL use only Do not write
SAMPLED Water-Drinking/Discharge/G Ccircle) VoA 8260/624/524.2 (circle) BNA 8270/625 (circle) Pesticides 8080/608 (circle) Pesticides 8080/608 (circle)	(I = (i	908	in shaded area
DATE DATE Containers No. of Containers (circle) VoA 8260/624/522 Soil / Sludge Oil / Sludge BNA 8270/625 (circle) VoA 8260/624/522	MPDES/ MPDES/ MPDES/ MAPDES/ M	Delow)	ب.
SAMPLED TIME (circle) Coint Solid (circle) Mater-Drinki (circle) Solid Solid (circle) Mater-Drinki (circle) Solid Solid (circle) Mater-Drinki (circle) Pesticides 80 Pesticides 80	SO (circles) SO (circles) SO (circles) SOO. (Circle		Project #
SAMPLED TIME Z & SO TO YOUNG TO TO SAMPLED TIME Z WAS SO TO TO SAMPLED TIME Z WAS SO TO TO SAMPLED TIME Z WAS SO TO SAMPL	EX 8020/60 PH 418.1/O) PH 8015m PH 8015m	70)	Custodian
	78 - 78 - 78 - 78 - 78 - 78 - 78 - 78 -		EAL Sample No.
	X X	×	
2(8.10) 3-13:-51- 14:00	x x	У.	
×3-4) 3-13-9F	× ×	×	
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ADDRESS (PUD Broadway Sk 1120	~	Wheat Higgs, Colorado 60033 (303) 425-6021	PROJECTID NACD, IL MEB
CITY DE LINE STATE (O ZIP & 6272)	<	FAX (303) 425-6854 (800) 845-7400	EAL QUOTE # 7224
PHONE 363 831- 8(00 FAX# 8	831-8203	FAX RESULTS Y N	TURNAROUND REQUIRED.
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CHAIN OF CUSTODY RECORD / ANALYTICAL SERVICES REQUEST

Page 3 of 3 Evergreen Analytical Inc. CLIENT CONTACT (pnnt) Jubilar (Life) Board St. 1000 STATE Co 21p 320 Lb 1 FAX (303) 425-6854 STATE Co 21p 320 Lb 1 FAX (303) 425-6854 (800) 845-7400 TURNAROUND REQUIRED. TURNAROUND REQUIRED. TURNAROUND Required turnaround subject to additional fee	ANALYSIS REQUESTED EAL use only Do not write	DATE Wo. of Containers Wo. of Containers Wo. of Containers Wo. of Containers Waler-Drinking/Discharge/Ground Circle) Waler-Drinking/Discharge/Ground Waler-Drinking/Discharge/Ground Pesticides 8150/515 (circle) Pesticides 8150/515 (circle) Pesticides 8150/515 (circle) Pesticides 8150/515 (circle) Pesticides 8150/515 (circle) Pesticides 8150/515 (circle) Pesticides 8150/515 (circle) Pesticides 8150/515 (circle) Pesticides 8150/515 (circle) Pesticides 8150/515 (circle) TYPH 8015mod. (Gasoline) Pesticides 8150/515 (circle) Pesticides 8150/515 (circle) TYPH 8015mod. (Gasoline) Pesticides 8150/515 (circle) Pesticides 8150/608 (circle) TYPH 8015mod. (Gasoline) Pesticides 8 itst metals below) TYPH 8015mod. (Gasoline) Pesticides 8 itst metals below) TYPH 418 1/Oil & Grease 413.1 (circle) TYPH 418 1/Oil & Grease 413.1 (circle) Pesticides 8 itst metals below) TYPH 8015mod. (Gasoline) Pesticides 8 itst metals below) TYPH 8015mod. (Gasoline) Pesticides 8 itst metals below) Pesticides 8 itst metals below) Pesticides 8 itst metals below) Pesticides 8 itst metals below) Pesticides 8 itst metals below) Pesticides 8 itst metals below) Pesticides 8 itst metals below) Pesticides 8 itst metals below)	93-12-95 (700 7 x	(2) 3 · 1, -6, 7 (8) 5c (1) x	3) 5.61-92 (350 1 x x x x x	3-6-45 1130 1 X X			Location Container Size	
ADDHESS PED BOTH ES CITY DONNEY STATE CO PHONE 1/3/3/15/15/	(print) C. Canton	Evergreen Analytical Cooler No. Grace Cooler Received Please PRINT all information: CLIENT SAMPLE IDENTIFICATION SAMPLED	7556 27-93-15-93	75-117 (16) 3-11-95	rsmr-7(6.3) 5-11-95	71.0 Blank 3-16-15			HT: DD:	Instructions:

BTEX Data Report

Client Sample Number Lab Sample Number Date Sampled Date Received Date Extracted/Prepared Date Analyzed Methanol Extract? % Moisture	: 75MP-2(2-4) : X04339 : 3/13/95 : 3/17/95 : 3/23/95 : 3/24/95 : No : 13.80%	Client Project No. Lab Project No. Dilution Factor Method Matrix Lab File No. Method Blank No.	: 722450.21020 MacDill AFB : 95-0871 : 5.00 : 8020 : Soil : BX2032326 : MB032395
Compound Name	Cas Number	Sample Concentration* ug/kg	PQL* ug/kg
Benzene	71-43-2	U	23
Toluene	108-88-3	630	23
Ethyl Benzene	100-41-4	680	23
Total Xylenes	1330-20-7	••	**
Chlorobenzene	108-90-7	**	**
1,3,5-trimethylbenzene	108-67-8	••	••
1,2,4-trimethylbenzene	95-63-6	••	••
1,2,3-trimethylbenzene	526-73-8	**	**
1,2,3,4-tetramethylbenzene	488-23-3	**	* *

Surrogate Recovery (\alpha, \alpha, \alpha - Trifluorotoluene):

128%

64%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

 * = See BX2032229 for noted values, df = 125, 03/23/95.

* = Dry Weight Basis.

QUALIFIERS:

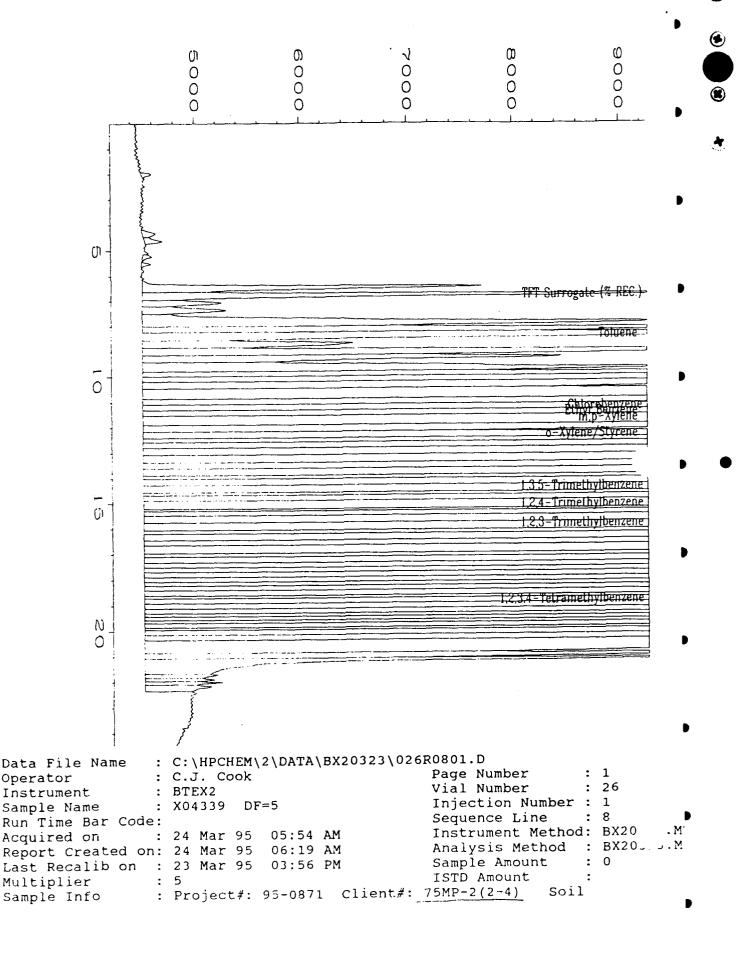
- E = Extrapolated value
- U = Compound analyzed for, but not detected.
- B = Compound found in blank and sample. Compare blank and sample data.
- J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available

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BTEX Data Report

Client Sample Number : 75MP-2(2-4) MacDill AFB Lab Sample Number : X04339 Lab Project No. : 95-0871 Date Sampled : 3/13/95 Dilution Factor : 125.00 Date Received : 3/17/95 Method : 8020 Date Extracted/Prepared : 3/22/95 Matrix : Soil Date Analyzed : 3/23/95 Lab File No. : 8X2032229 Methanol Extract? : Yes Method Blank No. : MEB032295 % Moisture : 13.80% Sample Compound Name Cas Number Concentration* PQL* ug/kg ug/kg ug/kg Benzene 71-43-2 ** Toluene 108-88-3 **	
Date Sampled : 3/13/95 Dilution Factor : 125.00 Date Received : 3/17/95 Method : 8020 Date Extracted/Prepared : 3/22/95 Matrix : Soil Date Analyzed : 3/23/95 Lab File No. : BX2032229 Methanol Extract? : Yes Method Blank No. : MEB032295 % Moisture : 13.80% Sample Compound Name Cas Number Concentration* PQL* ug/kg ug/kg ug/kg Benzene 71-43-2 ** ** Toluene 108-88-3 ** ** Ethyl Benzene 100-41-4 ** **	
Date Received : 3/17/95 Method : 8020 Date Extracted/Prepared : 3/22/95 Matrix : Soil Date Analyzed : 3/23/95 Lab File No. : 8X2032229 Methanol Extract? : Yes Method Blank No. : MEB032295 % Moisture : 13.80% Sample Compound Name Cas Number Concentration* PQL* ug/kg ug/kg ug/kg Benzene 71-43-2 ** ** Toluene 108-88-3 ** ** Ethyl Benzene 100-41-4 ** **	
Date Extracted/Prepared : 3/22/95 Matrix : Soil Date Analyzed : 3/23/95 Lab File No. : 8X2032229 Methanol Extract? : Yes Method Blank No. : MEB032295 % Moisture : 13.80% Sample Compound Name Cas Number Concentration* PQL* ug/kg ug/kg ug/kg Benzene 71-43-2 ** ** Toluene 108-88-3 ** ** Ethyl Benzene 100-41-4 ** **	
Date Analyzed : 3/23/95 Lab File No. : 8X2032229 Methanol Extract? : Yes Method Blank No. : MEB032295 % Moisture : 13.80% Sample Compound Name Cas Number Concentration* ug/kg PQL* ug/kg Benzene 71-43-2 ** ** Toluene 108-88-3 ** ** Ethyl Benzene 100-41-4 ** **	
Methanol Extract? : Yes Method Blank No. : MEB032295 % Moisture : 13.80% Sample Compound Name Cas Number Concentration* pQL* ug/kg Benzene 71-43-2 ** ** Toluene 108-88-3 ** ** Ethyl Benzene 100-41-4 ** **	
% Moisture : 13.80% Compound Name Cas Number Concentration* ug/kg PQL* ug/kg Benzene 71-43-2 ** ** Toluene 108-88-3 ** ** Ethyl Benzene 100-41-4 ** **	
Compound Name Cas Number Sample Concentration* ug/kg PQL* ug/kg Benzene 71-43-2 ** ** Toluene 108-88-3 ** ** Ethyl Benzene 100-41-4 ** **	
Compound Name Cas Number Concentration* ug/kg PQL* ug/kg Benzene 71-43-2 ** ** Toluene 108-88-3 ** ** Ethyl Benzene 100-41-4 ** **	
Benzene 71-43-2 ** ** Toluene 108-88-3 ** ** Ethyl Benzene 100-41-4 ** **	
Benzene 71-43-2 ** ** Toluene 108-88-3 ** ** Ethyl Benzene 100-41-4 ** **	
Toluene 108-88-3 ** ** Ethyl Benzene 100-41-4 **	
Ethyl Benzene 100-41-4 ** **	
Ethyl Benzene 100-41-4	
Total Xylenes 1330-20-7 640 580	
Chlorobenzene 108-90-7 150 J 580	
1,3,5-trimethylbenzene 108-67-8 1800 580	
1,2,4-trimethylbenzene 95-63-6 2000 580	
1,2,3-trimethylbenzene 526-73-8 1400 580	
1,2,3,4-tetramethylbenzene 488-23-3 2300 580	
Surrogate Recovery (α,α,α-Trifluorotoluene): 87% 64%-130% (QC I	limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

** = See BX2032326 for noted values, df = 5, 03/24/95.

* = Dry Weight Basis.

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

B = Compound found in blank and sample. Compare blank and sample data.

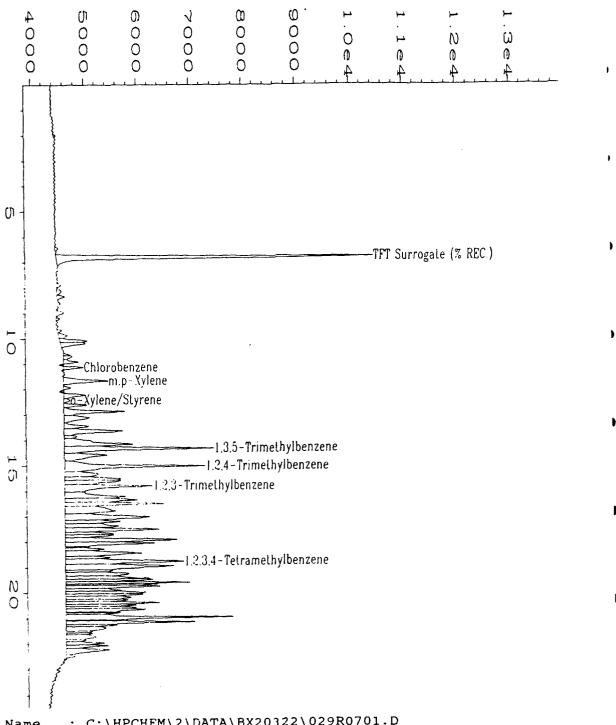
J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available.

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: C:\HPCHEM\2\DATA\BX20322\029R0701.D Data File Name Page Number : C.J. Cook Operator : 29 Vial Number : BTEX2 Instrument Injection Number DF=125 Sample Name : X04339 Sequence Line Run Time Bar Code: Instrument Method: BX2032 : 23 Mar 95 08:04 AM Acquired on : BX20322.... Analysis Method Report Created on: 23 Mar 95 08:30 AM 0 Sample Amount Last Recalib on : 22 Mar 95 04:04 PM ISTD Amount : 125 Multiplier : Project#: 95-0871 Client#: <u>75MP-2(2-4)</u> Soil Sample Info

BTEX Data Report

13/95 Dilut 17/95 Metl 22/95 Matr 22/95 Lab Metl	Project No. : 99 tion Factor : 1 hod : 80 rix : So File No. : B.	X2032213 B032295 PQL*
13/95 Dilut 17/95 Metl 22/95 Matr 22/95 Lab Metl 17.39% S Number Co	tion Factor : 1. hod : 86 rix : S6 File No. : B5 hod Blank No. : M Sample oncentration*	.00 020 oil X2032213 B032295
17/95 Metl 22/95 Matr 22/95 Lab Metl 17.39%	hod : 86 rix : So File No. : B: hod Blank No. : M Sample concentration*	020 oil X2032213 IB032295
22/95 Matr 22/95 Lab Metl 77.39%	rix : So File No. : B: hod Blank No. : M Sample concentration*	oil X2032213 IB032295
22/95 Lab Metl 77.39%	File No. : B. hod Blank No. : M Sample oncentration*	X2032213 B032295 PQL*
Meth 17.39% Is Number Co	hod Blank No. : M Sample oncentration*	B032295
7.39% s Number Co	Sample oncentration*	PQL*
s Number Co	oncentration*	
	oncentration*	
71-43-2	ug/kg	
71-43-2		ug/kg
	U	4.8
08-88-3	U	4.8
00-41-4	U	4.8
330-20-7	U	4.8
08-90-7	U	4.8
08-67-8	U	4.8
95-63-6	U	4.8
	U	4.8
26-73-8		
•	08-67-8 5-63-6	D8-67-8 U D5-63-6 U

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

Surrogate Recovery (\alpha, \alpha, \alpha-Trifluorotoluene):

* = Dry Weight Basis.

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

- B = Compound found in blank and sample. Compare blank and sample data.
- J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available.

Analyst

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94%

64%-130% (QC limits)

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            100
                   : C:\HPCHEM\2\DATA\BX20322\013R0701.D
Data File Name
                                                         Page Number
                    : C.J. Cook
                                                         Vial Number
                    : BTEX2
Instrument
                                                         Injection Number: 1
                    : X04340
                              DF=1
Sample Name
                                                         Sequence Line
                                                                             : 7
Run Time Bar Code:
                                                         Instrument Method: BX2032
                                   08:11 PM
                    : 22 Mar 95
Acquired on
                                                                                         .1'
                                                         Analysis Method : BX2032
Report Created on: 22 Mar 95
                                   08:36 PM
Last Recalib on : 22 Mar 95
                                                         Sample Amount
                                   04:04 PM
                                                         ISTD Amount
Multiplier
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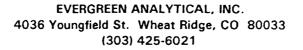
: Project#: 95-0871 Client#: 75MP-2(8-10)

Soil

Dm. 4/5/95

Sample Info

Operator



BTEX Data Report

		Client Project No.	: 722450.21020
Client Sample Number	: 75MP-2(8-10)		MacDill AFB
Lab Sample Number	: X04340DUP	Lab Project No.	: 95-0871
Date Sampled	: 3/13/95	Dilution Factor	: 1.00
Date Received	: 3/17/95	Method	: 8020
Date Extracted/Prepared	: 3/22/95	Matrix	: Soil
Date Analyzed	: 3/22/95	Lab File No.	: BX2032214
Methanol Extract?	: No	Method Blank No.	: MB032295
% Moisture	: 17.39%		

	Sample			
Compound Name	Cas Number	Concentration*	PQL*	
		ug/kg	ug/kg	
Benzene	71-43-2	U	4.8	
Toluene	108-88-3	U	4.8	
Ethyl Benzene	100-41-4	1.2 J	4.8	
Total Xylenes	1330-20-7	3.5 J	4.8	
Chlorobenzene	108-90-7	U	4.8	
1,3,5-trimethylbenzene	108-67-8	U	4.8	
1,2,4-trimethylbenzene	95-63-6	U	4.8	
1,2,3-trimethylbenzene	526-73-8	U	4.8	
1,2,3,4-tetramethylbenzene	488-23-3	9.3	4.8	

Surrogate Recovery $(\alpha, \alpha, \alpha$ -Trifluorotoluene):

87%

64%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

* = Dry Weight Basis.

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

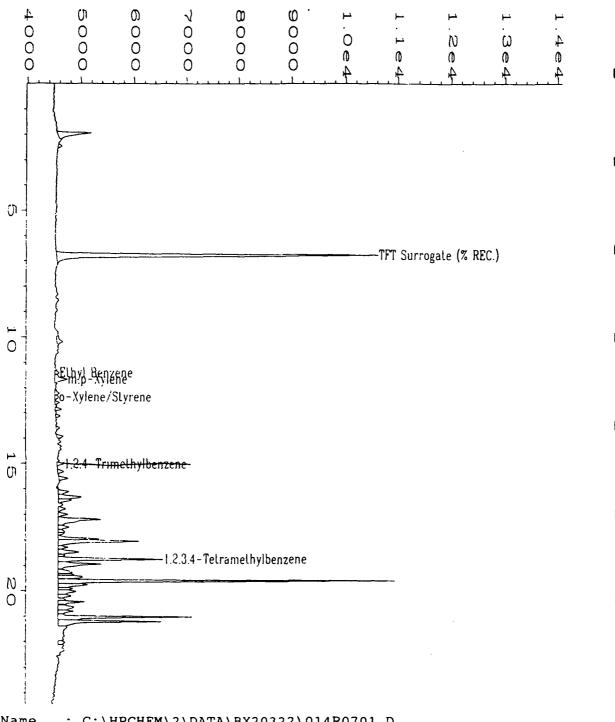
- B = Compound found in blank and sample. Compare blank and sample data.
- J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available/

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Data File Name
                 : C:\HPCHEM\2\DATA\BX20322\014R0701.D
Operator
                 : C.J. Cook
                                                 Page Number
Instrument
                 : BTEX2
                                                 Vial Number
                                                                   : 14
Sample Name
                 : X04340DUP
                              DF=1
                                                 Injection Number: 1
Run Time Bar Code:
                                                                  : 7
                                                 Sequence Line
Acquired on
                 : 22 Mar 95
                              08:55 PM
                                                 Instrument Method: BX2032.
Report Created on: 22 Mar 95
                              09:20 PM
                                                 Analysis Method : BX20322.rlT
Last Recalib on : 22 Mar 95
                              04:04 PM
                                                 Sample Amount
Multiplier
                                                 ISTD Amount
Sample Info
                 : Project#: 95-0871 Client#: 75MP-2(8-10)
                                                                Soil
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pre 4/5/98

BTEX Data Report

Client Project No.

: 722450.21020

64%-130% (QC limits)

Client Sample Number	: 75MP-3(3-5)	·	MacDill AFB
Lab Sample Number	: X04344	Lab Project No.	: 95-0871
Date Sampled	: 3/14/95	Dilution Factor	: 1.00
Date Received	: 3/17/95	Method	: 8020
Date Extracted/Prepared	: 3/22/95	Matrix	: Soil
Date Analyzed	: 3/23/95	Lab File No.	: BX2032222
Methanol Extract?	: No	Method Blank No.	: MB032295
% Moisture	: 15.00%		
70 moiotai 0	. 10.0070	Sample	
Compound Name	Cas Number	Concentration	PQL
		ug/kg	ug/kg
Benzene	71-43-2	U	4.7
Toluene	108-88-3	U	4.7
Ethyl Benzene	100-41-4	U	4.7
Total Xylenes	1330-20-7	U	4.7
Chlorobenzene	108-90-7	U	4.7
1,3,5-trimethylbenzene	108-67-8	U	4.7
404	25.22.2		
1,2,4-trimethylbenzene	95-63-6	U	4.7
1.2.2 trimothyllhamans	E26 72 0	U	4.7
1,2,3-trimethylbenzene	526-73-8	U	4.7
1,2,3,4-tetramethylbenzene	488-23-3	U	4.7
1,2,3,4-tetramethylberizene	700-23-3	O .	7./

83%

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

Surrogate Recovery (α,α,α -Trifluorotoluene):

* = Dry Weight Basis.

QUALIFIERS:

- E = Extrapolated value
- U = Compound analyzed for, but not detected.
- B = Compound found in blank and sample. Compare blank and sample data.
- J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).
- PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available.

Analyst

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                                                       -TFT Surrogate (% REC.)
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(J)
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Data File Name
                 : C:\HPCHEM\2\DATA\BX20322\022R0701.D
Operator
                 : C.J. Cook
                                                 Page Number
Instrument
                 : BTEX2
                                                 Vial Number
                                                                   : 22
Sample Name
                 : X04344DUP
                              DF=1
                                                 Injection Number: 1
Run Time Bar Code:
                                                 Sequence Line
Acquired on
                 : 23 Mar 95
                              02:52 AM
                                                 Instrument Method: BX2032:
Report Created on: 23 Mar 95
                              03:17 AM
                                                 Analysis Method : BX20322.ml
Last Recalib on
                : 22 Mar 95
                              04:04 PM
                                                 Sample Amount
Multiplier
                 : 1
                                                 ISTD Amount
Sample Info
                 : Project#: 95-0871 Client#: 75MP-3(3-5)
                                                              Soil
```

Am 4/5/95

BTEX Data Report

		Client Project No.	: 722450.21020
Client Sample Number	: 75MP-4(8-10)		MacDill AFB
Lab Sample Number	: X04345	Lab Project No.	: 95-0871
Date Sampled	: 3/14/95	Dilution Factor	: 1.00
Date Received	: 3/17/95	Method	: 8020
Date Extracted/Prepared	: 3/22/95	Matrix	: Soil
Date Analyzed	: 3/23/95	Lab File No.	: BX2032223
Methanol Extract?	: No	Method Blank No.	: MB032295
% Moisture	: 16.96%		
		Sample	
Compound Name	Cas Number	Concentration*	PQL*
		ug/kg	ug/kg
Benzene	71-43-2	U	4.8
Toluene	108-88-3	0.9 J	4.8
Ethyl Benzene	100-41-4	16	4.8
Total Xylenes	1330-20-7	1.5 J	4.8
Chlorobenzene	108-90-7	U	4.8
1,3,5-trimethylbenzene	108-67-8	U	4.8
1,2,4-trimethylbenzene	95-63-6	U	4.8

Surrogate Recovery (\alpha, \alpha, \alpha - Trifluorotoluene):

87%

14

64%-130% (QC limits)

4.8

4.8

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

* = Dry Weight Basis.

1,2,3-trimethylbenzene

1,2,3,4-tetramethylbenzene

QUALIFIERS:

- E = Extrapolated value
- U = Compound analyzed for, but not detected.
- B = Compound found in blank and sample. Compare blank and sample data.

526-73-8

488-23-3

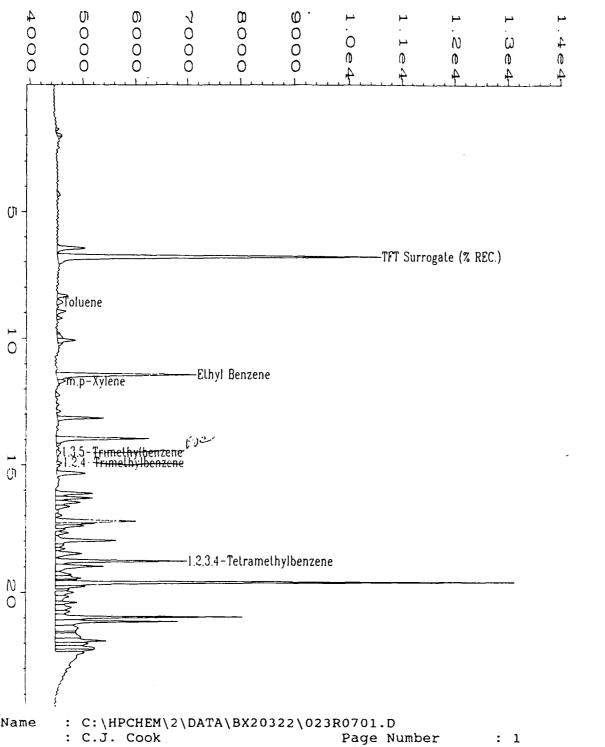
J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available.

Analyst

Approved



Data File Name Operator Instrument : BTEX2 Vial Number : X04345 DF=1 Sample Name Injection Number: 1 Run Time Bar Code: Sequence Line Acquired on : 23 Mar 95 03:37 AM Instrument Method: BX2032 Report Created on: 23 Mar 95 04:02 AM Analysis Method : BX20322.al Last Recalib on : 22 Mar 95 04:04 PM Sample Amount Multiplier ISTD Amount Sample Info : Project#: 95-0871 Client#: 75MP-4(8-10) Soil

Pm 415/5/

BTEX Data Report

		Client Project No.	: 722450.21020
Client Sample Number	: 75MP-4(13-15)		MacDill AFB
Lab Sample Number	: X04346	Lab Project No.	: 95-0871
Date Sampled	: 3/14/95	Dilution Factor	: 1.00
Date Received	: 3/17/95	Method	: 8020
Date Extracted/Prepared	: 3/22/95	Matrix	: Soil
Date Analyzed	: 3/23/95	Lab File No.	: BX2032224
Methanol Extract?	: No	Method Blank No.	: MB032295
% Moisture	: 17.77%		
		Sample	
Compound Name	Cas Number	Concentration*	PQL*
		ug/kg	ug/kg
Benzene	71-43-2	U	4.9
Toluene	108-88-3	U	4.9
Ethyl Benzene	100-41-4	U	4.9
Total Xylenes	1330-20-7	U	4.9
Chlorobenzene	108-90-7	U	4.9
1,3,5-trimethylbenzene	108-67-8	U	4.9
1,2,4-trimethylbenzene	95-63-6	U	4.9
1,2,3-trimethylbenzene	526-73-8	U	4.9
1,2,3,4-tetramethylbenzene	488-23-3	1.3 J	4.9
			· · · · · · · · · · · · · · · · · · ·

Surrogate Recovery (α,α,α-Trifluorotoluene):

95%

64%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

* = Dry Weight Basis.

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

B = Compound found in blank and sample. Compare blank and sample data.

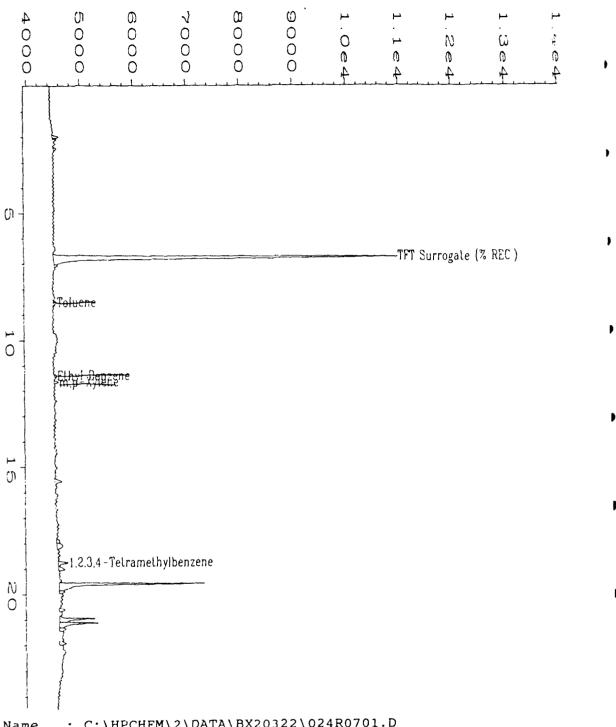
J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Datection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available.

Analyst

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: C:\HPCHEM\2\DATA\BX20322\024R0701.D
Data File Name
                 : C.J. Cook
                                                 Page Number
Operator
                                                 Vial Number
Instrument
                 : BTEX2
                                                 Injection Number: 1
Sample Name
                   X04346
                           DF=1
                                                 Sequence Line
Run Time Bar Code:
                                                 Instrument Method: BX2032.
                 : 23 Mar 95
                              04:21 AM
Acquired on
                                                                 : BX20322.MT
                                                 Analysis Method
Peport Created on: 23 Mar 95
                              04:46 AM
                                                                   : 0
                                                 Sample Amount
Last Recalib on : 22 Mar 95
                              04:04 PM
                                                 ISTD Amount
Multiplier
                 : Project#: 95-0871 Client#: 75MP-4(13-15)
                                                                Soil
Sample Info
```

in 4/5/95

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BTEX Data Report

		Client Project No.	: 722450.21020
Client Sample Number	: 75MP-5(4-6)		MacDill AFB
Lab Sample Number	: X04347	Lab Project No.	: 95-0871
Date Sampled	: 3/14/95	Dilution Factor	: 1.00
Date Received	: 3/17/95	Method	: 8020
Date Extracted/Prepared	: 3/22/95	Matrix	: Soil
Date Analyzed	: 3/23/95	Lab File No.	: BX2032225
Methanol Extract?	: No	Method Blank No.	: MB032295
% Moisture	: 15.13%		
		Sample	
Compound Name	Cas Number	Concentration*	PQL*
		ug/kg	ug/kg
Benzene	71-43-2	U	4.7
Toluene	108-88-3	U	4.7
Edhal Danisa	100 41 4	U	4.7
Ethyl Benzene	100-41-4	U	4.7
Total Xylenes	1330-20-7	υ	4.7
70(0.71,70.700	.000 20 7	_	
Chlorobenzene	108-90-7	U	4.7
1,3,5-trimethylbenzene	108-67-8	U	4.7
1,2,4-trimethylbenzene	95-63-6	U	4.7
			. ~
1,2,3-trimethylbenzene	526-73-8	U	4.7
1,2,3,4-tetramethylbenzene	488-23-3	U	4.7
1,2,3,4-tetrametriyibenzene	400-23-3	9	4.1

Surrogate Recovery (\alpha, \alpha, \alpha Trifluorotoluene):

88%

64%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

* = Dry Weight Basis.

QUALIFIERS:

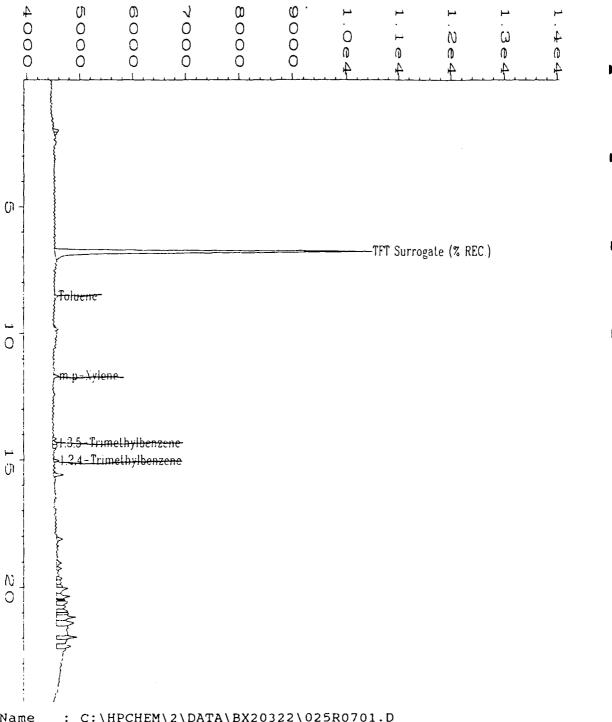
- E = Extrapolated value
- U = Compound analyzed for, but not detected.
- B = Compound found in blank and sample. Compare blank and sample data.
- J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available

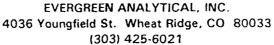
Analyst

Approved



: C:\HPCHEM\2\DATA\BX20322\025R0701.D Data File Name : C.J. Cook Page Number Operator Vial Number Instrument : BTEX2 Injection Number: 1 Sample Name : X04347 DF=1 Run Time Bar Code: Sequence Line Instrument Method: BX2032? : 23 Mar 95 05:06 AM Acquired on Analysis Method : BX20322.... Report Created on: 23 Mar 95 05:31 AM Sample Amount Last Recalib on : 22 Mar 95 04:04 PM ISTD Amount Multiplier : Project#: 95-0871 Client#: 75MP-5(4-6) Soil Sample Info

im 4/5/95



eat Ridge, CO 80033 -6021

BTEX Data Report

	•	Client Project No.	: 722450.21020
Client Sample Number	: 75MP-5(6-8)		MacDill AFB
Lab Sample Number	: X04348	Lab Project No.	: 95-0871
Date Sampled	: 3/14/95	Dilution Factor	: 1.00
Date Received	: 3/17/95	Method	: 8020
Date Extracted/Prepared	: 3/22/95	Matrix	: Soil
Date Analyzed	: 3/23/95	Lab File No.	: BX2032226
Methanol Extract?	: No	Method Blank No.	: MB032295
% Moisture	: 17.55%		
		Sample	
Compound Name	Cas Number	Concentration*	PQL*
		ug/kg	ug/kg
Benzene	71-43-2	U	4.9
Toluene	108-88-3	U	4.9
Ethyl Benzene	100-41-4	U	4.9
Total Xylenes	1330-20-7	U	4.9
Chlorobenzene	108-90-7	U	4.9
1,3,5-trimethylbenzene	108-67-8	U	4.9
1,2,4-trimethylbenzene	95-63-6	υ	4.9
1,2,3-trimethylbenzene	526-73-8	U	4.9
1,2,3,4-tetramethylbenzene	488-23-3	U	4.9
Surrogate Recovery (α,α,α-Trif	luorotoluene):	91%	64%-130% (QC limits)

Surrogate Recovery $(\alpha, \alpha, \alpha$ -Trifluorotoluene):

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

* = Dry Weight Basis.

QUALIFIERS:

- E = Extrapolated value
- U = Compound analyzed for, but not detected.
- B = Compound found in blank and sample. Compare blank and sample data.
- J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 18, Part II, pa. 8000-14.

NA = Not available.

Analyst

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                    1.3.5 Trimelhylbenzene
                    1.2.1 Trimethylbenzene
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             O
                     : C:\HPCHEM\2\DATA\BX20322\026R0701.D
Data File Name
                                                            Page Number
                     : C.J. Cook
                                                            Vial Number
                                                                                  : 26
                     : BTEX2
Instrument
                                                            Injection Number: 1
                     : X04348 DF=1
Sample Name
```

: 7

Instrument Method: BX2032?

Analysis Method : BX20322...

Sequence Line

Sample Amount

ISTD Amount

Sample Info Dr 4/5/95

Multiplier

Operator

Acquired on

Run Time Bar Code:

Report Created on: 23 Mar 95

Last Recalib on : 22 Mar 95

: 23 Mar 95

05:51 AM

06:16 AM

04:04 PM

: Project#: 95-0871 Client#: 75MP-5(6-8)

BTEX Data Report

Client Project No.

: 722450.21020

Client Sample Number	: 75MP-7(6-8)		MacDill AFB
Lab Sample Number	: X04360	Lab Project No.	: 95-0871
Date Sampled	: 3/15/95	Dilution Factor	: 1.00
Date Received	: 3/17/95	Method	: 8020
Date Extracted/Prepared	: 3/23/95	Matrix	: Soil
Date Analyzed	: 3/24/95	Lab File No.	: BX2032322
Methanol Extract?	: No	Method Blank No.	: MB032395
% Moisture	: 16.80%		
		Sample	
Compound Name	Cas Number	Concentration*	PQL*
		ug/kg	ug/kg
Benzene	71-43-2	U	4.8
Toluene	108-88-3	U	4.8
Ethyl Benzene	100-41-4	U	4.8
Total Xylenes	1330-20-7	U	4.8
Chlorobenzene	108-90-7	U	4.8
1,3,5-trimethylbenzene	108-67-8	0.6 J	4.8
1,2,4-trimethylbenzene	95-63-6	0.5 J	4.8
1,2,3-trimethylbenzene	526-73-8	U	4.8
1,2,3,4-tetramethylbenzene	488-23-3	0.7 J	4.8
Surrogate Recovery (α,α,α-Triffs	uorotoluene):	93%	64%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

* = Dry Weight Basis.

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

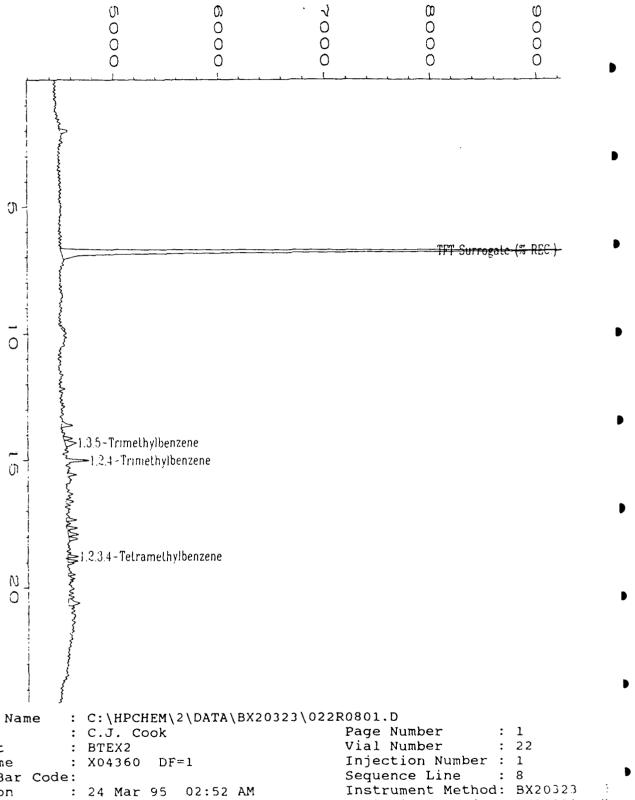
B = Compound found in blank and sample. Compare blank and sample data.

J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available.

Appro



Data File Name Operator Instrument Sample Name Run Time Bar Code: Acquired on Analysis Method : BX20323.mi Report Created on: 24 Mar 95 03:17 AM Sample Amount Last Recalib on : 23 Mar 95 03:56 PM ISTD Amount Multiplier : 1 : Project#: 95-0871 Client#: 75MP-7(6-8) Soil Sample Info

BTEX Data Report

Client Project No.

Client Sample Number Lab Sample Number Date Sampled	: 75MP-7(6-8) : X04360DUP : 3/15/95	Lab Project No. Dilution Factor	MacDill AFB : 95-0871 : 1.00
Date Received Date Extracted/Prepared Date Analyzed	: 3/17/95 : 3/23/95 : 3/24/95	Method Matrix Lab File No.	: 8020 : Soil : BX2032323
Methanol Extract? % Moisture	: No : 16.80%	Method Blank No.	: MB032395
Compound Name	Cas Number	Sample Concentration* ug/kg	PQL* ug/kg
Benzene	71-43-2	U	4.8
Toluene	108-88-3	U	4.8
Ethyl Benzene	100-41-4	U	4.8
Total Xylenes	1330-20-7	U	4.8
Chlorobenzene	108-90-7	U	4.8
1,3,5-trimethylbenzene	108-67-8	1.2 J	4.8
1,2,4-trimethylbenzene	95-63-6	1.2 J	4.8
1,2,3-trimethylbenzene	526-73-8	U	4.8
1,2,3,4-tetramethylbenzene	488-23-3	1.4 J	4.8

Surrogate Recovery (α, α, α -Trifluorotoluene):

88%

64%-130% (QC limits)

: 722450.21020

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

* = Dry Weight Basis.

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

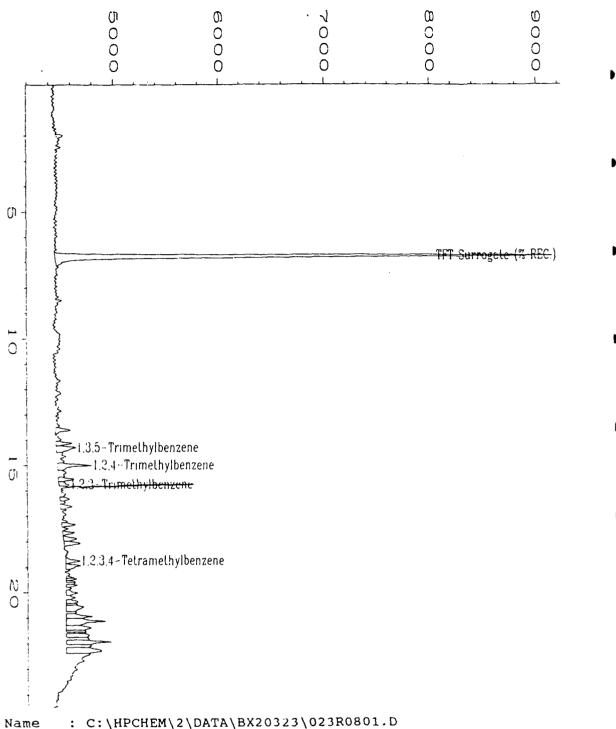
B = Compound found in blank and sample. Compare blank and sample data.

J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available.

Analyst



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: C:\HPCHEM\2\DATA\BX20323\023R0801.D
Data File Name
Operator
                 : C.J. Cook
                                                 Page Number
                                                 Vial Number
Instrument
                 : BTEX2
                                                 Injection Number: 1
Sample Name
                   X04360DUP
                              DF=1
                                                 Sequence Line
Run Time Bar Code:
                                                 Instrument Method: BX2032
Acquired on
                 : 24 Mar 95
                              03:38 AM
                                                 Analysis Method
                                                                  : BX20325
Report Created on: 24 Mar 95
                              04:03 AM
                                                 Sample Amount
Last Recalib on : 23 Mar 95
                              03:56 PM
                                                 ISTD Amount
Multiplier
                 : Project#: 95-0871 Client#: 75MP-7(6-8)
                                                              Soil
Sample Info
             Dm 4/5/CK
```

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BTEX Data Report

Client Project No.

75%

: 722450.21020

64%-130% (QC limits)

Client Sample Number	: 75SD-1		MacDill AFB
Lab Sample Number	: X04353	Lab Project No.	: 95-0871
Date Sampled	: 3/15/95	Dilution Factor	: 1.00
Date Received	: 3/17/95	Method	: 8020
Date Extracted/Prepared	: 3/23/95	Matrix	: Soil
Date Analyzed	: 3/23/95	Lab File No.	: BX2032312
Methanol Extract?	: No	Method Blank No.	: MB032395
% Moisture	: 10.69%		
		Sample	
Compound Name	Cas Number	Concentration*	PQL*
		ug/kg	ug/kg
Benzene	71-43-2	U	4.5
Toluene	108-88-3	U	4.5
Ethyl Benzene	100-41-4	υ	4.5
Total Xylenes	1330-20-7	U	4.5
Chlorobenzene	108-90-7	U	4.5
1,3,5-trimethylbenzene	108-67-8	U	4.5
1,2,4-trimethylbenzene	95-63-6	U	4.5
1,2,3-trimethylbenzene	526-73-8	U	4.5
		U	

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

Surrogate Recovery (\alpha, \alpha, \alpha-Trifluorotoluene):

* = Dry Weight Basis.

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

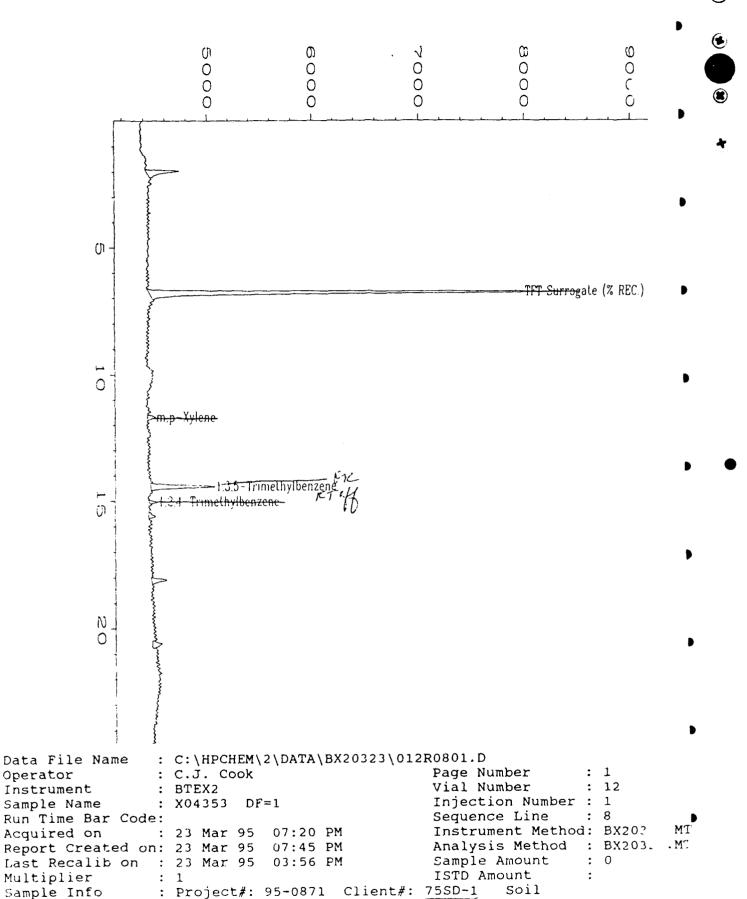
B = Compound found in blank and sample. Compare blank and sample data.

J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available.

Analyst Appr



pm4/5/97

BTEX Data Report

	,	Client Project No.	: 722450.21020
Client Sample Number	: 75SD-1		MacDill AFB
Lab Sample Number	: X04353DUP	Lab Project No.	: 95-0871
Date Sampled	: 3/15/95	Dilution Factor	: 1.00
Date Received	: 3/17/95	Method	: 8020
Date Extracted/Prepared	: 3/23/95	Matrix	: Soil
Date Analyzed	: 3/23/95	Lab File No.	: BX2032313
Methanol Extract?	: No	Method Blank No.	: MB032395
% Moisture	: 10.69%		
		Sample	
Compound Name	Cas Number	Concentration*	PQL*
		ug/kg	ug/kg
Benzene	71-43-2	U	4.5
Toluene	108-88-3	U	4.5
Ethyl Benzene	100-41-4	U	4.5
Total Xylenes	1330-20-7	U	4.5
Chlorobenzene	108-90-7	U	4.5
1,3,5-trimethylbenzene	108-67-8	U	4.5
1,2,4-trimethylbenzene	95-63-6	U	4.5
1,2,3-trimethylbenzene	526-73-8	U	4.5
1,2,3,4-tetramethylbenzene	488-23-3	U	4.5
Surrogate Recovery (α,α,α-Trifl	uorotoluene):	68%	64%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

* = Dry Weight Basis.

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

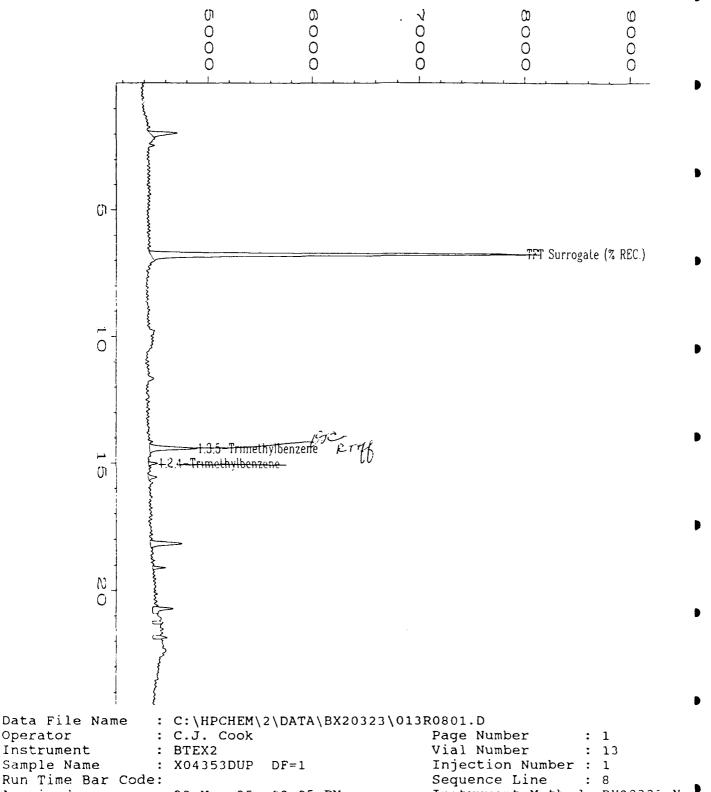
B = Compound found in blank and sample. Compare blank and sample data.

J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not avellable

Analyst



: 23 Mar 95 Instrument Method: BX2032 Acquired on 08:05 PM Report Created on: 23 Mar 95 08:30 PM Analysis Method : BX203 Last Recalib on : 23 Mar 95 Sample Amount 03:56 PM ISTD Amount Multiplier : 1 Sample Info : Project#: 95-0871 Client#: 75SD-1 Soil

Dr. 4/2/95

Operator

BTEX Data Report

		Client Project No.	: 722450.21020
Client Sample Number	: 75SD-2		MacDill AFB
Lab Sample Number	: X04354	Lab Project No.	: 95-0871
Date Sampled	: 3/15/95	Dilution Factor	: 1.00
Date Received	: 3/17/95	Method	: 8020
Date Extracted/Prepared	: 3/23/95	Matrix	: Soil
Date Analyzed	: 3/23/95	Lab File N o.	: BX2032314
Methanol Extract?	: No	Method Blank No.	: MB032395
% Moisture	: 10.72%		
		Sample	
Compound Name	Cas Number	Concentration*	PQL*
	···	ug/kg	ug/kg
Benzene	71-43-2	U	4.5
Toluene	108-88-3	U	4.5
Ethyl Benzene	100-41-4	U	4.5
Total Xylenes	1330-20-7	1.0 J	4.5
Chlorobenzene	108-90-7	U	4.5
1,3,5-trimethylbenzene	108-67-8	U	4.5
1,2,4-trimethylbenzene	95-63-6	0.4 J	4.5
1,2,3-trimethylbenzene	526-73-8	U	4.5
1,2,3,4-tetramethylbenzene	488-23-3	U	4.5

71%

64%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

Surrogate Recovery (\alpha,\alpha,\alpha-Trifluorotoluene):

* = Dry Weight Basis.

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

- B = Compound found in blank and sample. Compare blank and sample data.
- J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 18, Part II, pa. 8000-14.

NA = Not available

Apalyst

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                   ≽o-Xylene/Styrene
                          -1.3.5-Trimethylbenzene 环 🖔
                     -1.2.4-Trimethylbenzene
            O
                     1.2.3.1-Tetramethylbenzene
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Data File Name
                   : C:\HPCHEM\2\DATA\BX20323\014R0801.D
                    : C.J. Cook
                                                        Page Number
Instrument
                    : BTEX2
                                                        Vial Number
Sample Name
                    : X04354 DF=1
                                                        Injection Number : 1
Run Time Bar Code:
                                                        Sequence Line
                                                        Instrument Method: BX2032^
Acquired on
                    : 23 Mar 95
                                   08:49 PM
Report Created on: 23 Mar 95
                                   09:14 PM
                                                        Analysis Method : BX2032
Last Recalib on : 23 Mar 95
                                  03:56 PM
                                                        Sample Amount
                                                                              0
                                                        ISTD Amount
Multiplier
Sample Info
                    : Project#: 95-0871 Client#: 75SD-2
```

for atilar

Operator

BTEX Data Report

Client Sample Number Lab Sample Number Date Sampled Date Received Date Extracted/Prepared Date Analyzed Methanol Extract? % Moisture	: 75SD-3 : X04355 : 3/15/95 : 3/17/95 : 3/23/95 : 3/23/95 : No : 11.87%	Client Project No. Lab Project No. Dilution Factor Method Matrix Lab File No. Method Blank No. Sample	: 722450.21020 MacDill AFB : 95-0871 : 1.00 : 8020 : Soil : BX2032317 : MB032395
Compound Name	Cas Number	Concentration*	PQL*
		ug/kg	ug/kg
Benzene	71-43-2	U	4.5
Toluene	108-88-3	U	4.5
Ethyl Benzene	100-41-4	U	4.5
Total Xylenes	1330-20-7	0.9 J	4.5
Chlorobenzene	108-90-7	U	4.5
1,3,5-trimethylbenzene	108-67-8	υ	4.5
1,2,4-trimethylbenzene	95-63-6	U	4.5
1,2,3-trimethylbenzene	526-73-8	U	4.5
1,2,3,4-tetramethylbenzene	488-23-3	U	4.5
Surrogate Recovery (α,α,α-Trif	uorotoluene):	66%	64%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

* = Dry Weight Basis.

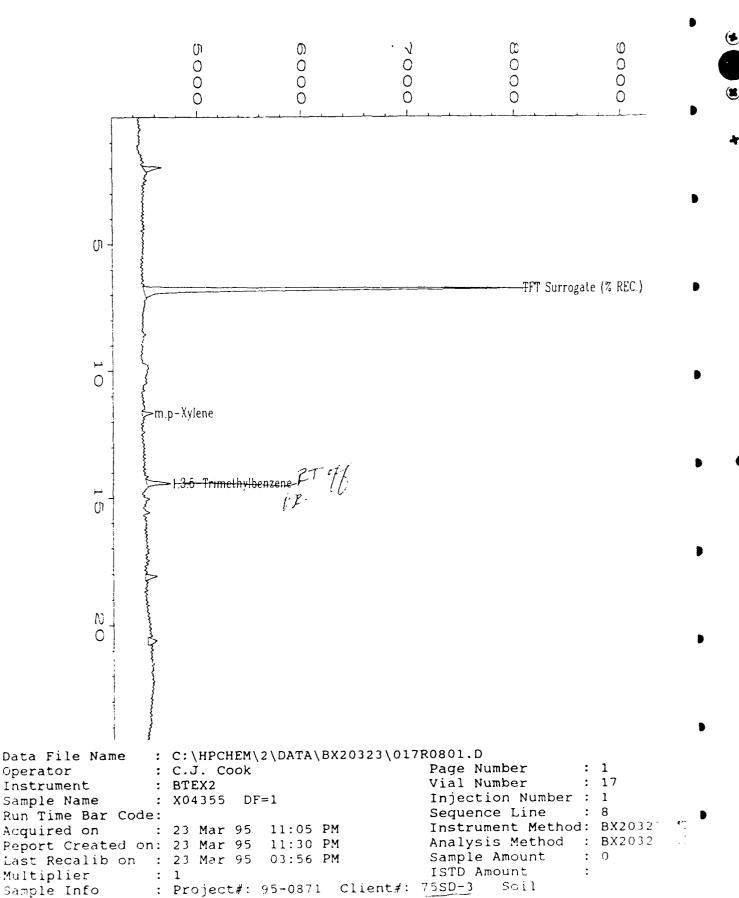
QUALIFIERS:

- E = Extrapolated value
- U = Compound analyzed for, but not detected.
- B = Compound found in blank and sample. Compare blank and sample data.
- J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available:

Arralyst



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BTEX Data Report

Client Project No.

: 722450.21020

Client Sample Number	: 75SD-4		MacDill AFB
Lab Sample Number	: X04356	Lab Project No.	: 95-0871
Date Sampled	: 3/15/95	Dilution Factor	: 5.00
Date Received	: 3/17/95	Method	: 8020
Date Extracted/Prepared	: 3/23/95	Matrix	: Soil
Date Analyzed	: 3/23/95	Lab File No.	: BX2032318
Methanol Extract?	: No	Method Blank No.	: MB032395
% Moisture	: 37.24%		
		Sample	
Compound Name	Cas Number	Concentration*	PQL*
		ug/kg	ug/kg
Benzene	71-43-2	U	32
Toluene	108-88-3	U	32
Ethyl Benzene	100-41-4	U	32
Total Xylenes	1330-20-7	U	32
Chlorobenzene	108-90-7	U	32
1,3,5-trimethylbenzene	108-67-8	U	32
1,2,4-trimethylbenzene	95-63-6	U	32
1,2,3-trimethylbenzene	526-73-8	U	32
1,2,3,4-tetramethylbenzene	488-23-3	9.6 J	32
Surrogate Recovery (α,α,α-Trifl	uorotoluene):	85%	64%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

* = Dry Weight Basis.

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

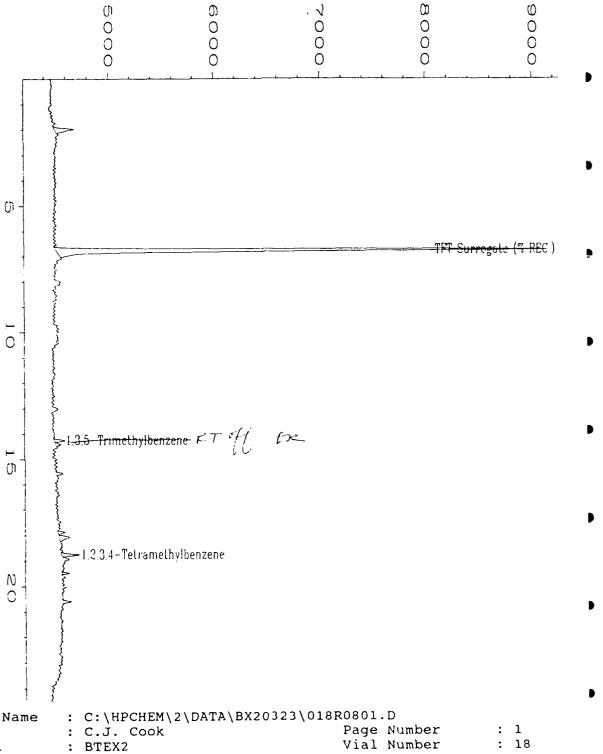
B = Compound found in blank and sample. Compare blank and sample data.

J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not augulable.

Apalyst



Data File Name Operator Instrument Injection Number: 1 : X04356 DF=5 Sample Name : 8 Sequence Line Run Time Bar Code: Instrument Method: BX20 : 23 Mar 95 11:50 PM Acquired on : BX2c 3 . : Report Created on: 24 Mar 95 Analysis Method 00:15 AM Last Recalib on : 23 Mar 95 03:56 PM Sample Amount ISTD Amount Multiplier : Project#: 95-0871 Client#: <u>75SD-4</u> Sample Info

BTEX Data Report

Client Sample Number Lab Sample Number Date Sampled Date Received Date Extracted/Prepared Date Analyzed Methanol Extract? % Moisture	: 75SS-3(3-4) : X04341 : 3/13/95 : 3/17/95 : 3/22/95 : 3/22/95 : No : 14.37%	Client Project No. Lab Project No. Dilution Factor Method Matrix Lab File No. Method Blank No. Sample	: 722450.21020 MacDill AFB : 95-0871 : 1.00 : 8020 : Soil : BX2032215 : MB032295
Compound Name	Cas Number	Concentration*	PQI *
		ug/kg	ug/kg
Benzene	71-43-2	U	4.7
Toluene	108-88-3	U	4.7
Ethyl Benzene	100-41-4	U	4.7
Total Xylenes	1330-20-7	0.7 J	4.7
Chlorobenzene	108-90-7	U	4.7
1,3,5-trimethylbenzene	108-67-8	U	4.7
1,2,4-trimethylbenzene	95-63-6	U	4.7
1,2,3-trimethylbenzene	526-73-8	υ	4.7
1,2,3,4-tetramethylbenzene	488-23-3	U	4.7
Surrogate Recovery (α,α,α-Trifle	uorotoluene):	91%	64%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

* = Dry Weight Basis.

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

B = Compound found in blank and sample. Compare blank and sample data.

J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available

Analyst

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Data File Name : C:\HPCHEM\2\DATA\BX20322\015R0701.D
                                                       Page Number
                   : C.J. Cook
                                                                           : 15
                                                       Vial Number
                   : BTEX2
Instrument
                                                       Injection Number: 1
                   : X04341 DF=1
Sample Name
                                                                           : 7
                                                       Sequence Line
Run Time Bar Code:
                                                       Instrument Method: BX2032<sup>*</sup>
                                  09:40 PM
                   : 22 Mar 95
Acquired on
                                                       Analysis Method : BX2032.
Report Created on: 22 Mar 95
                                  10:05 PM
                                                       Sample Amount
Last Recalib on : 22 Mar 95
                                 04:04 PM
                                                       ISTD Amount
Multiplier
                   : Project#: 95-0871 Client#: 75SS-3(3-4)
                                                                      Soil
Sample Info
```

*

pm 4/5/95

Operator

EVERGREEN ANALYTICAL, INC.

4036 Youngfield St. Wheat Ridge, CO 80033 (303) 425-6021

BTEX Data Report

Client Sample Number Lab Sample Number Date Sampled Date Received Date Extracted/Prepared Date Analyzed Methanol Extract? % Moisture	: 75SS-3(8-10) : X04342 : 3/13/95 : 3/17/95 : 3/22/95 : 3/22/95 : No : 17.99%	Client Project No. Lab Project No. Dilution Factor Method Matrix Lab File No. Method Blank No. Sample	: 722450.21020 MacDill AFB : 95-0871 : 1.00 : 8020 : Soil : BX2032218 : MB032295
Compound Name	Cas Number	Concentration*	PQL*
		ug/kg	ug/kg
Benzene	71-43-2	U	4.9
Toluene	108-88-3	U	4.9
Ethyl Benzene	100-41-4	U	4.9
Total Xylenes	1330-20-7	U	4.9
Chlorobenzene	108-90 - 7	U	4.9
1,3,5-trimethylbenzene	108-67-8	U	4.9
1,2,4-trimethylbenzene	95-63-6	U	4.9
1,2,3-trimethylbenzene	526-73-8	U	4.9
1,2,3,4-tetramethylbenzene	488-23-3	1.9 J	4.9
Surrogate Recovery (α,α,α-Trit	fluorotoluene):	81%	64%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

* = Dry Weight Basis.

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

B = Compound found in blank and sample. Compare blank and sample data.

J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available.

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(j)
        1.2.3.4 - Telramethylbenzene
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Data File Name
Operator
                                                 Page Number
                 : C.J. Cook
Instrument
                 : BTEX2
                                                 Vial Number
                                                                   : 18
Sample Name
                 : X04342
                           DF=1
                                                 Injection Number: 1
Run Time Bar Code:
                                                 Sequence Line
                                                                  : 7
                                                 Instrument Method: BX2032.
Acquired on
                 : 22 Mar 95
                              11:53 PM
                                                 Analysis Method : BX20322.MT
Report Created on: 23 Mar 95
                              00:19 AM
Last Recalib on : 22 Mar 95
                              04:04 PM
                                                 Sample Amount
Multiplier
                                                 ISTD Amount
                 : 1
Sample Info
                 : Project#: 95-0871 Client#: 75SS-3(8-10)
                                                               Soil
```

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BTEX Data Report

		Client Project No.	: 722450.21020
Client Sample Number	: 75SS-6(3-5)		MacDill AFB
Lab Sample Number	: X04350	Lab Project No.	: 95-0871
Date Sampled	: 3/15/95	Dilution Factor	: 1.00
Date Received	: 3/17/95	Method	: 8020
Date Extracted/Prepared	: 3/22/95	Matrix	: Soil
Date Analyzed	: 3/23/95	Lab File No.	: BX2032228
Methanol Extract?	: No	Method Blank No.	: MB032295
% Moisture	: 15.12%		
		Sample	
Compound Name	Cas Number	Concentration*	PQL*
		_ug/kg	ug/kg
Benzene	71-43-2	Ū	4.7
Toluene	108-88-3	U	4.7
Ethyl Benzene	100-41-4	U	4.7
Total Xylenes	1330-20-7	U	4.7
Chlorobenzene	108-90-7	U	4.7
1,3,5-trimethylbenzene	108-67-8	υ	4.7
1,2,4-trimethylbenzene	95-63-6	U	4.7
1,2,3-trimethylbenzene	526-73-8	U	4.7
1,2,3,4-tetramethylbenzene	488-23-3	U	4.7
Surrogate Recovery (α,α,α-Trif	luorotoluene):	85%	64%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

* = Dry Weight Basis.

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

B = Compound found in blank and sample. Compare blank and sample data.

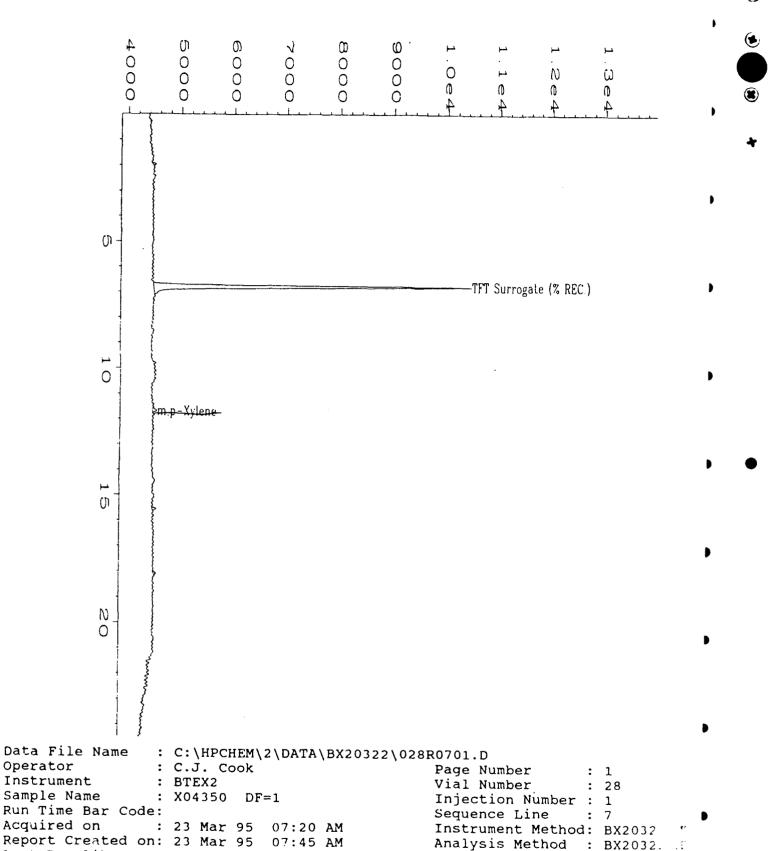
J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available

Analyst App

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Multiplier : Project#: 95-0871 Client#: 75SS-6(3-5) Sample Info

Last Recalib on : 22 Mar 95

04:04 PM

ISTD Amount

Sample Amount

Soil

pmyls/95

BTEX Data Report

		Client Project No.	: 722450.21020
Client Sample Number	: 75SS-6(7-9)		MacDill AFB
Lab Sample Number	: X04351	Lab Project No.	: 95-0871
Date Sampled	: 3/15/95	Dilution Factor	: 1.00
Date Received	: 3/17/95	Method	: 8020
Date Extracted/Prepared	: 3/23/95	Matrix	: Soil
Date Analyzed	: 3/24/95	Lab File No.	: BX2032324
Methanol Extract?	: No	Method Blank No.	: MB032395
% Moisture	: 19.65%		
		Sample	
Compound Name	Cas Number	Concentration*	PQL*
		ug/kg	ug/kg
Benzene	71-43-2	U	5.0
Toluene	108-88-3	U	5.0
Ethyl Benzene	100-41-4	U	5.0
Total Xylenes	1330-20-7	U	5.0
Chlorobenzene	108-90-7	U	5.0
1,3,5-trimethylbenzene	108-67-8	U	5.O
1,2,4-trimethylbenzene	95-63-6	U	5.0
1,2,3-trimethylbenzene	526-73-8	U	5.0
1,2,3,4-tetramethylbenzene	488-23-3	U	5.0
Surrogate Recovery (α,α,α-Trif	luorotoluene):	93%	64%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

* = Dry Weight Basis.

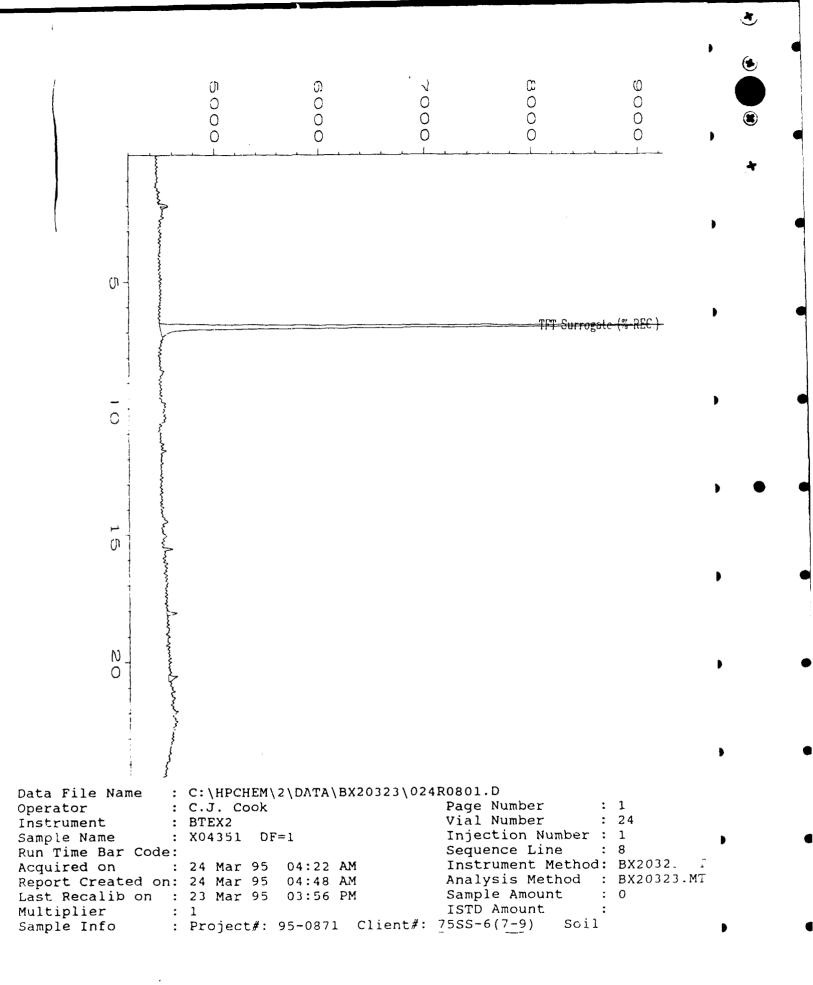
QUALIFIERS:

- E = Extrapolated value
- U = Compound analyzed for, but not detected.
- B = Compound found in blank and sample. Compare blank and sample data.
- J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 18, Part II, pa. 8000-14.

NA = Not available.

Analyst



BTEX Data Report

Client Project No.

		Onem Project No.	. /22730.210	
Client Sample Number	: 75\$\$-6(22-24)		MacDill AFB	
Lab Sample Number	: X04352	Lab Project No.	: 95-0871	
Date Sampled	: 3/15/95	Dilution Factor	: 1.00	
Date Received	: 3/17/95	Method	: 8020	
Date Extracted/Prepared	: 3/23/95	Matrix	: Sail	
Date Analyzed	: 3/24/95	Lab File No.	: BX2032325	
Methanol Extract?	: No	Method Blank No.	: MB032395	
% Moisture	: 16.18%			
		Sample		
Compound Name	Cas Number	Concentration*	PQL*	
		ug/kg	ug/kg	
Benzene	71-43-2	3.3 J	4.8	
Toluene	108-88-3	U	4.8	
Ethyl Benzene	100-41-4	υ	4.8	
Total Xylenes	1330-20-7	υ	4.8	
Chlorobenzene	108-90-7	U	4.8	
1,3,5-trimethylbenzene	108-67-8	U	4.8	
1,2,4-trimethylbenzene	95-63-6	U	4.8	
1,2,3-trimethylbenzene	526-73-8	U	4.8	

Surrogate Recovery $(\alpha,\alpha,\alpha$ -Trifluorotoluene):

86%

64%-130% (QC limits)

: 722450.21020

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

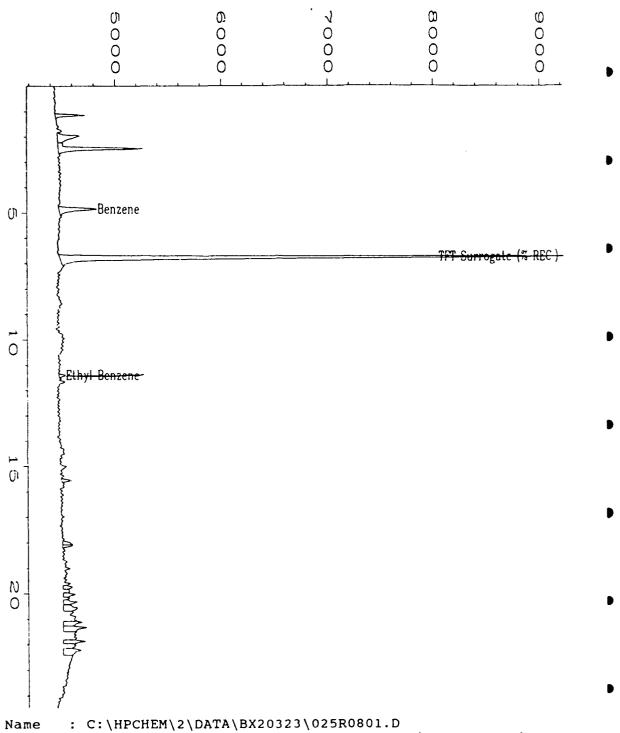
* = Dry Weight Basis.

QUALIFIERS:

- E = Extrapolated value
- U = Compound analyzed for, but not detected.
- B = Compound found in blank and sample. Compare blank and sample data.
- J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).
- PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detectiop-Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not ayallable.

Analyst



3

Data File Name Page Number : C.J. Cook Operator Vial Number Instrument BTEX2 Injection Number: 1 X04352 DF=1Sample Name : 8 Sequence Line Run Time Bar Code: : 24 Mar 95 05:09 AM Instrument Method: BX205 Acquired on Report Created on: 24 Mar 95 Analysis Method : BX20323.N 05:34 AM Sample Amount : 0 Last Recalib on : 23 Mar 95 03:56 PM ISTD Amount : 1 Multiplier Sample Info : Project#: 95-0871 Client#: 75SS-6(22-24) Soil

Cm 4/5/95

BTEX Data Report

		Client Project No.	: 722450.21020
Client Sample Number	: 75SS-15(4-6)		MacDill AFB
Lab Sample Number	: X04349	Lab Project No.	: 95-0871
Date Sampled	: 3/14/95	Dilution Factor	: 1.00
Date Received	: 3/17/95	Method	: 8020
Date Extracted/Prepared	: 3/22/95	Matrix	: Soil
Date Analyzed	: 3/23/95	Lab File No.	: BX2032227
Methanol Extract?	: No	Method Blank No.	: MB032295
% Moisture	: 16.97%		
		Sample	
Compound Name	Cas Number	Concentration*	PQL*
	· ·	ug/kg	ug/kg
Benzene	71-43-2	U	4.8
Toluene	108-88-3	U	4.8
Ethyl Benzene	100-41-4	υ	4.8
Total Xylenes	1330-20-7	U	4.8
Chlorobenzene	108-90-7	U	4.8
1,3,5-trimethylbenzene	108-67-8	U	4.8
1,2,4-trimethylbenzene	95-63-6	U	4.8
1,2,3-trimethylbenzene	526-73-8	U	4.8
1,2,3,4-tetramethylbenzene	488-23-3	U	4.8

Surrogate Recovery (α,α,α-Trifluorotoluene):

86%

64%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

* = Dry Weight Basis.

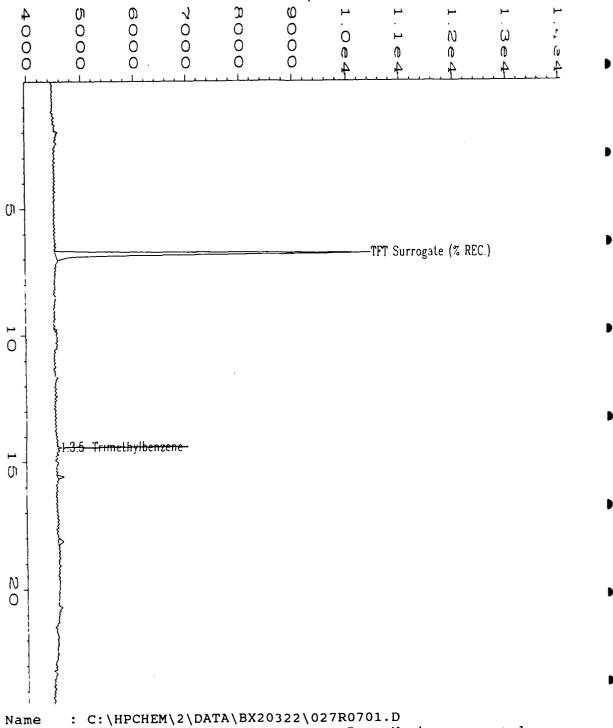
QUALIFIERS:

- E = Extrapolated value
- U = Compound analyzed for, but not detected.
- B = Compound found in blank and sample. Compare blank and sample data.
- J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available.

Analyst



Data File Name Page Number : C.J. Cook Operator Vial Number : 27 : BTEX2 Instrument Injection Number: 1 : X04349 DF=1 Sample Name : 7 Sequence Line Run Time Bar Code: Instrument Method: BX203 : 23 Mar 95 06:36 AM Acquired on : BX20322.M Analysis Method Report Created on: 23 Mar 95 07:01 AM Sample Amount Last Recalib on : 22 Mar 95 04:04 PM ISTD Amount Multiplier Soil : Project#: 95-0871 Client#: 75SS-15(4-6) Sample Info

Dm 4/5/95

BTEX Data Report

		Client Project No.	: 722450.21020
Client Sample Number	: 75SW-1		MacDill AFB
Lab Sample Number	: X04357	Lab Project No.	: 95-0871
Date Sampled	: 3/15/95	Dilution Factor	: 1.00
Date Received	: 3/17/95	Method	: 602
Date Extracted/Prepared	: 3/23/95	Matrix	: Water
Date Analyzed	: 3/24/95	Lab File No.	: BX2032320
Methanol Extract?	: No	Method Blank No.	: MB032395
% Moisture	NA		
		^ '	

70 1110101010					
		Sample			
Compound Name	Cas Number	Concentration	PQL		
		ug/L	ug/L		
Benzene	71-43-2	U	4.0		
Toluene	108-88-3	U	4.0		
rolaciic	100 00 0	v	4.0		
Ethyl Benzene	100-41-4	U	4.0		
Total Xylenes	1330-20-7	U	4.0		
Chlorobenzene	108-90-7	U	4.0		
		-			
1,3,5-trimethylbenzene	108-67-8	U	4.0		
		• •	4.0		
1,2,4-trimethylbenzene	95-63-6	U	4.0		
1,2,3-trimethylbenzene	526-73-8	U	4.0		
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	323 . 0 0	_			
1,2,3,4-tetramethylbenzene	488-23-3	U	4.0		

Surrogate Recovery (α,α,α-Trifluorotoluene): 90

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

QUALIFIERS:

- E = Extrapolated value
- U = Compound analyzed for, but not detected.
- B = Compound found in blank and sample. Compare blank and sample data.
- J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).
- PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection-kimit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

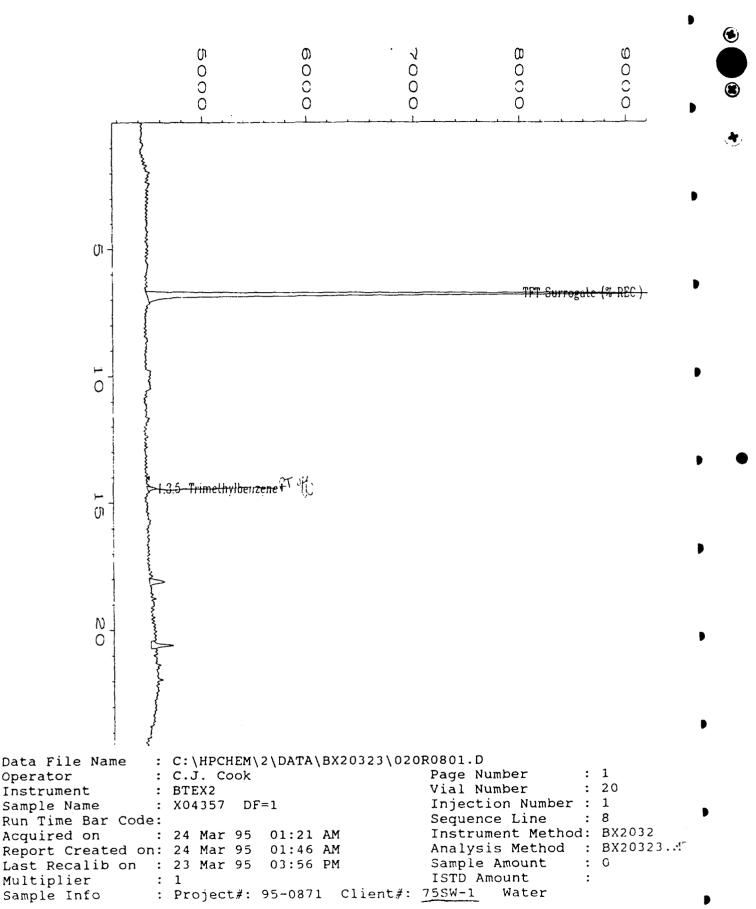
NA = Not available.

Approved

70%-130% (QC limits)

90%

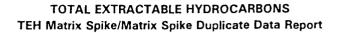
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Evergreen Analytical, Inc. 4036 Youngfield, Wheat Ridge, CO 80033 (303) 425-6021



Client Sample No.

: 75MP-2(8-10)

Client Project No.

: 722450.21020/MACDI

Lab Sample No.

: X04340

Lab Project No.

: 95-0871

Date Sampled

: 3/13/95

EPA Method No.

: 3500/MOD. 8015

Date Received

: 3/17/95

Matrix

: SOIL

Date Prepared

: 3/20/95

Method Blank

: SB032095

Date Analyzed : 3/24/95

	Spike	Sample	MS	Ţ	QC
Compound	Added	Concentration	Concentration	MS	Limits
	(ug/mL)	(ug/mL)	(ug/mL)	%REC	%REC
Jet Fuel A	1000	217	1170	95	60-140

	Spike	MSD		222)C
Compound	Added (ug/mL)	Concentration (ug/mL)	MSD %REC	RPD	RPD	nits %REC
Jet Fuel A	1000	1090	87	8.8	50	60-140

* = Value	s outside	of QC	limits.
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RPD:

0 out of (1) outside limits.

Spike Recovery:

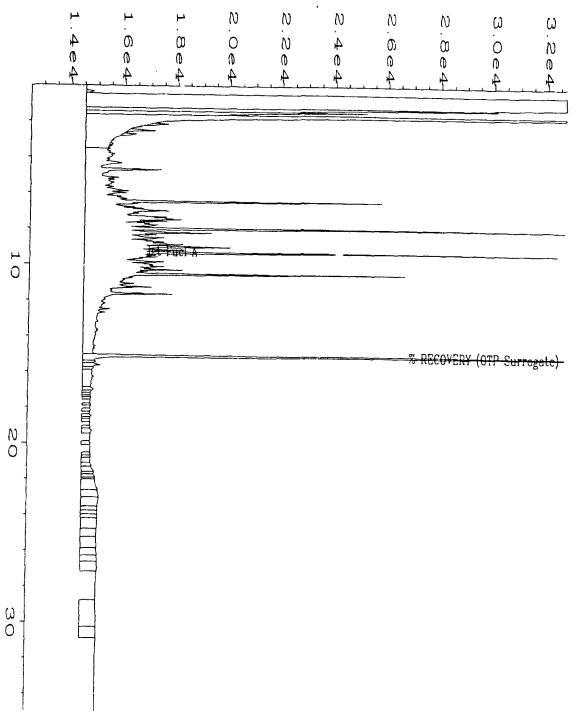
0 out of (1) outside limits.

Comments:

NA = Not analyzed/not applicable.

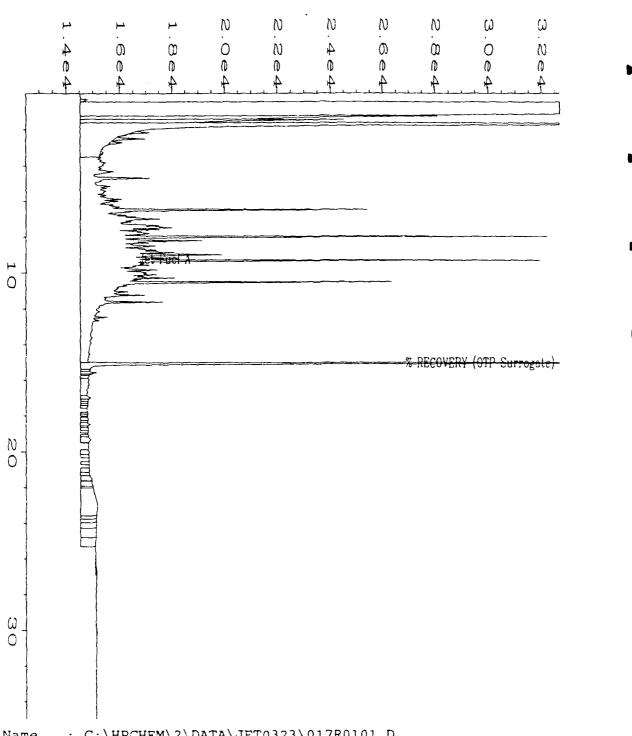
Values reported in ug/mL in the liquid extract.

My



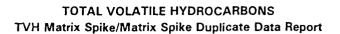
<u>*</u>

Data File Name :	C:\HPCHEM\2\DATA\JET0323\01	6R0101.D
Instrument : Sample Name :	Dawn N. Guildner TEH X04340 MS	Page Number : 1 Vial Number : 16 Injection Number : 1
Run Time Bar Code: Acquired on : Report Created on: Last Recalib on :	24 Mar 95 12:05 PM 24 Mar 95 12:40 PM 24 MAR 95 08:06 AM 1	Sequence Line : 1 Instrument Method: JET0323.MT Analysis Method : JET0323.MT Sample Amount : 0 ISTD Amount : Clickt #75M?-2(8-IG) m5



: C:\HPCHEM\2\DATA\JET0323\017R0101.D Data File Name : Dawn N. Guildner Page Number)perator Vial Number : 17 Instrument : TEH lample Name : X04340 MSD Injection Number: 1 : 1 Time Bar Code: Sequence Line : 24 Mar 95 12:55 PM Instrument Method: JET0323 MTH uired on eport Created on: 24 Mar 95 01:30 PM ast Recalib on : 24 MAR 95 08:06 AM Analysis Method : JET0323.MTH Sample Amount ISTD Amount ultiplier. : Soil Spike Duplicate ample Info Client # 75MP-3(8-10) MSD

Evergreen Analytical, Inc. 4036 Youngfield, Wheat Ridge, CO 80033 (303) 425-6021





Client Sample No.

: 75SS-6(7-9)

Client Project No.

: 722450.21020/MACD

Lab Sample No.

: X04352

Lab Project No. EPA Method No. : 95-0871 : 5030/8015 Mod

Date Sampled

: 3/13/95 : 3/17/95

Matrix

: SOIL

Date Received Date Prepared

: 3/23/95

Method Blank

: MB022395

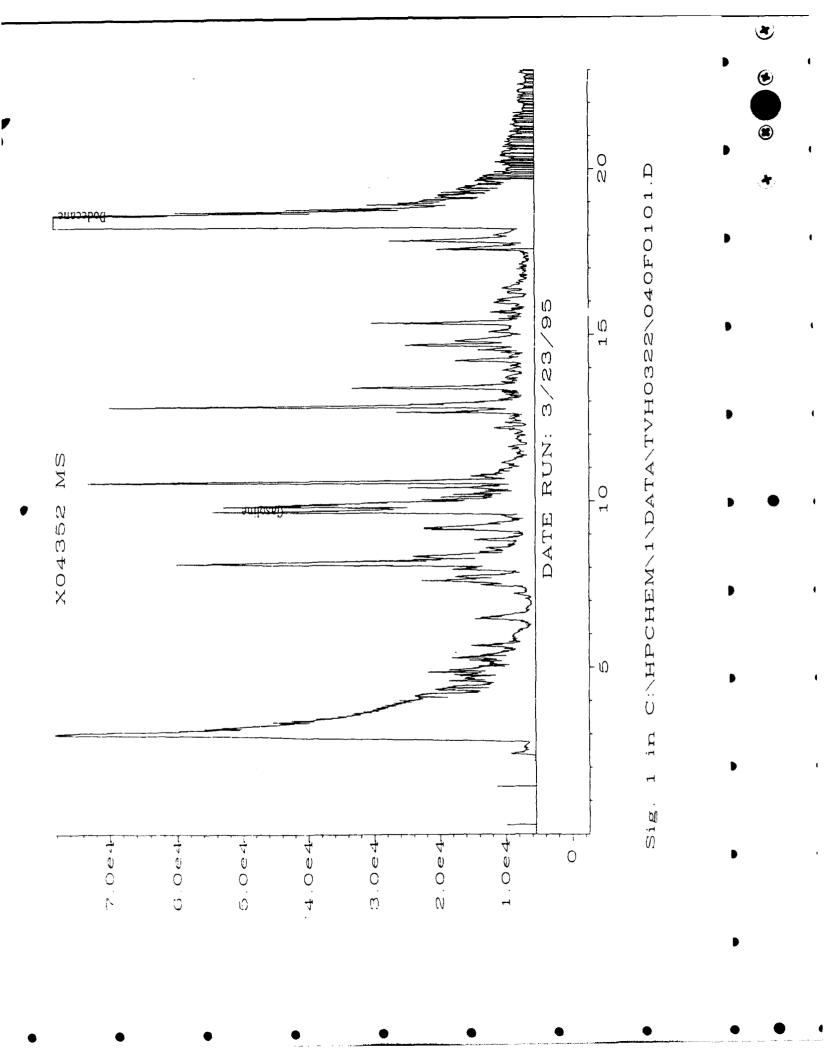
Date Analyzed : 3/23/95

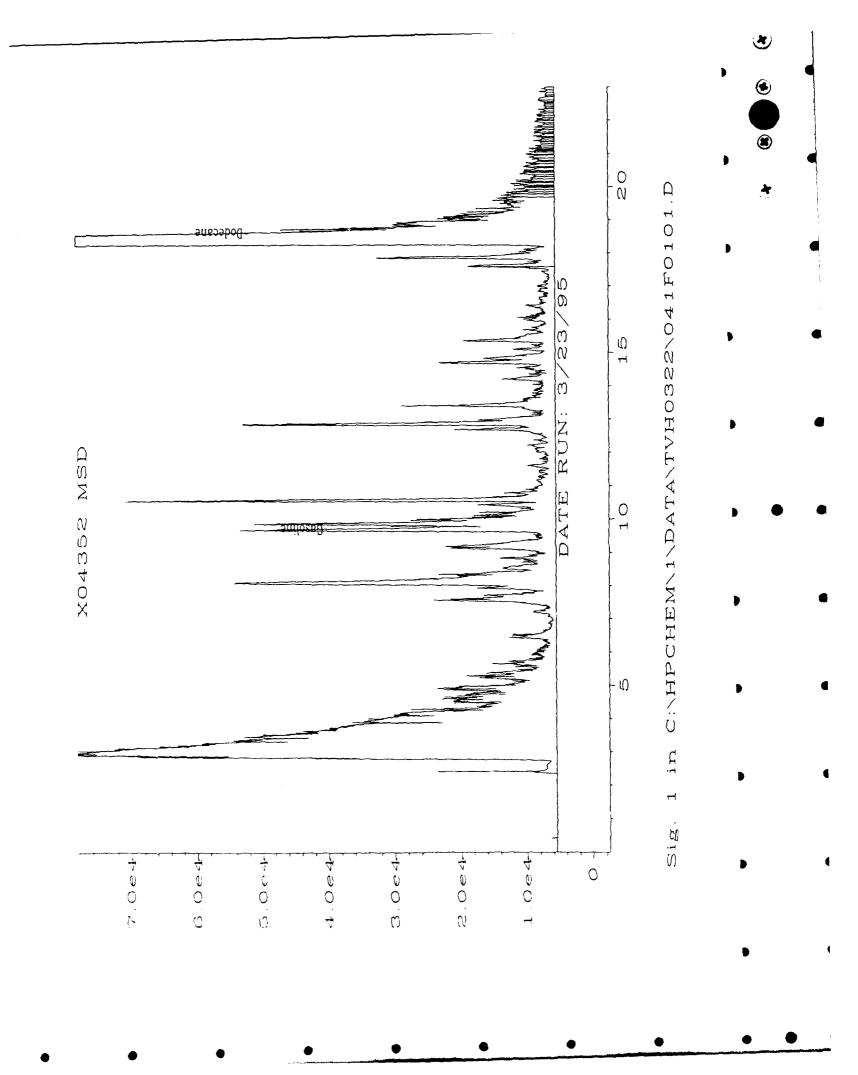
	Spike	Sample	MS		QC
Compound	Added	Concentration	Concentration	MS	Limits
	(mg/L)	_(mg/L)	(mg/L)	%REC	%REC
Gasoline	5.00	2.53	8.58	121	60-140

	Spike	MSD	}			C
Compound	Added	Concentration	MS	RPD	Liı	mits
	(mg/L)	(mg/L)	%REC		RPD	%REC
Gasoline	5.00	9.12	132	8.5	50	60-140

* = Values outside o	of QC limits.
RPD:	O out of (1) outside limits.
Spike Recovery:	O out of (2) outside limits.
Comments:	NA = Not analyzed/not applicable.







Evergreen Analytical, Inc. 4036 Youngfield, Wheat Ridge, CO 80033 (303) 425-6021



Client Project No.

: 722450.21020

Client Sample No. :

: 75SS-3(3-4)

MacDill AFB

Lab Sample No.
Date Sampled

: X04341

Lab Project No. EPA Method No. : 95-0871 : 8020

Date Received

: 3/13/95 : 3/17/95

Matrix

: 6020 : Soil

Date Prepared

: 3/17/95

Lab File Number(s)

: BX2032216,17

Date Analyzed

: 3/22/95

Method Blank

: MB032295

	Spike	Sample	MS		QC
Compound	Added	Concentration	Concentration	MS	Limits
	(ug/L)	(ug/L)	(ug/L)	%REC	%REC
Benzene	20.0	0.0	17.5	88	65-121
Toluene	20.0	0.0	18.1	91	69-117
Ethyl Benzene	20.0	0.0	17.1	86	68-118
m,p-Xylene	40.0	0.0	33.6	84	66-116
o-Xylene	20.0	0.0	17.2	86	73-117
Chlorobenzene	20.0	0.0	17.0	85	65-121
1,3,5-TMB	20.0	0.0	16.9	85	65-121
1,2,4-TMB	20.0	0.0	16.4	82	65-121
1,2,3-TMB	20.0	0.0	16.0	80	65-121
1,2,3,4-TeMB	20.0	0.0	15.5	78	65-121

	Spike	MSD				DC .
Compound	Added	Concentration	MSD	RPD	Lir	nits
	(ug/L)	(ug/L)	%REC		RPD	%REC
Benzene	20.0	17.7	89	1.1	17.4	65-121
Toluene	20.0	17.5	88	3.4	15.8	69-117
Ethyl Benzene	20.0	17.6	88	2.9	11.9	68-118
m,p-Xylene	40.0	34.9	87	3.8	15.4	66-116
o-Xylene	20.0	17.6	88	2.3	13.2	73-117
Chlorobenzene	20.0	17.0	85	0.0	17.4	65-121
1,3,5-TMB	20.0	16.9	85	0.0	17.4	65-121
1,2,4-TMB	20.0	15.4	77	6.3	17.4	65-121
1,2,3-TMB	20.0	16.4	82	2.5	17.4	65-121
1,2,3,4-TeMB	20.0	14.4	72	7.4	17.4	65-121

7 :	= \	/alue:	s out	side	ot	uC	limits

RPD:

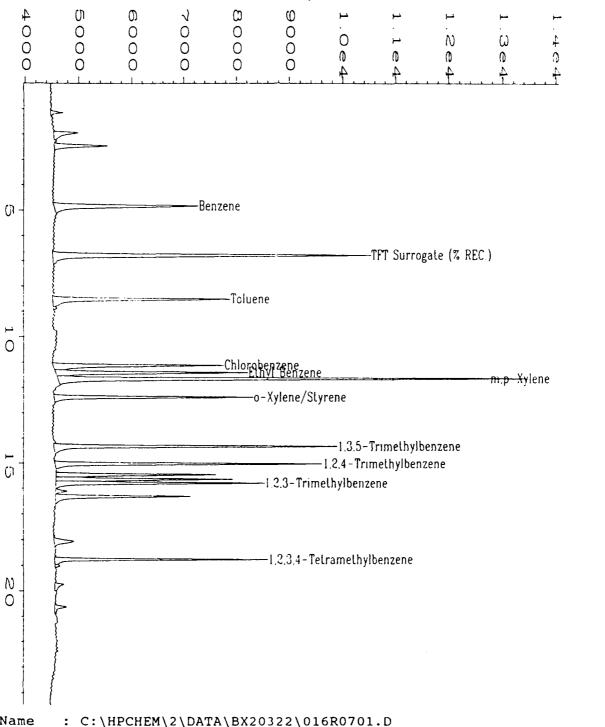
0 out of (10) outside limits.

Spike Recovery:

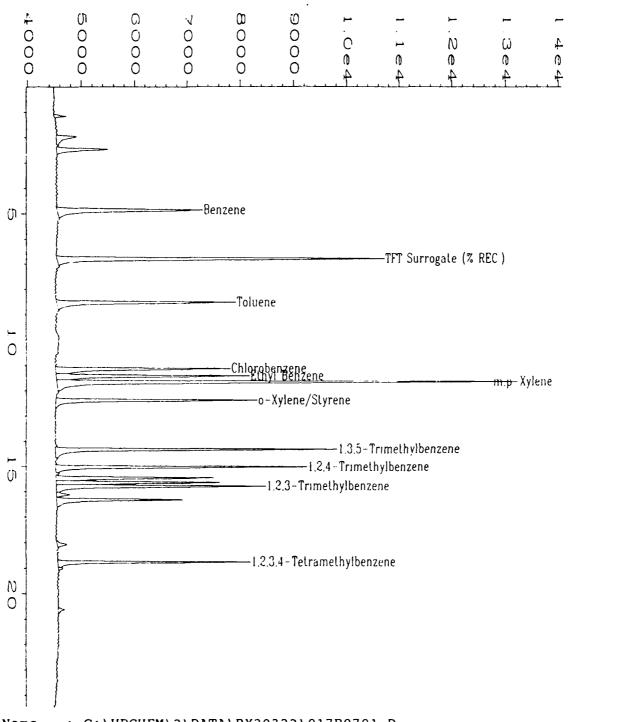
0 out of (20) outside limits.

Comments:

Analyst



Data File Name Operator C.J. Cook Page Number Instrument Vial Number BTEX2 : 16 Sample Name X04341MS Injection Number : 1 DF=1Run Time Bar Code: Sequence Line : 7 Acquired on 10:24 PM Instrument Method: BX2032 : 22 Mar 95 Report Created on: 22 Mar 95 10:49 PM Analysis Method : BX20322.M' Last Recalib on : 22 Mar 95 04:04 PM Sample Amount Multiplier ISTD Amount : Project#: 95-0871 Client#: 75MP-3(3-4) Sample Info Soil



Data File Name : C:\HPCHEM\2\DATA\BX20322\017R0701.D Operator : C.J. Cook Page Number Instrument : BTEX2 Vial Number : 17 Sample Name : X04341MSD DF=1Injection Number: 1 in Time Bar Code: Sequence Line 7 Instrument Method: BX20322.MTH .squired on : 22 Mar 95 11:09 PM Report Created on: 22 Mar 95 11:34 PM Analysis Method : BX20322.MTH Last Recalib on : 22 Mar 95 04:04 PM Sample Amount Multiplier ISTD Amount : 1 Sample Info : Project#: 95-0871 Client#: 75MP-3(3-4) Soil

BTEX Data Report

·		Client Project No.	: 722450.21020
Client Sample Number	: Trip Blank		MacDill AFB
Lab Sample Number	: X04361	Lab Project No.	: 95-0871
Date Sampled	: 3/15/95	Dilution Factor	: 1.00
Date Received	: 3/17/95	Method	: 8020
Date Extracted/Prepared	: 3/23/95	Matrix	: Water
Date Analyzed	: 3/24/95	Lab File No.	: BX2032321
Methanol Extract?	: No	Method Blank No.	: MB032395
% Moisture	NA		

Communicated Names	On a Nill and a si	Sample	501
Compound Name	Cas Number	Concentration ug/L	PQL ug/L
Benzene	71-43-2	Ū	4.0
Toluene	108-88-3	U	4.0
Ethyl Benzene	100-41-4	υ	4.0
Total Xylenes	1330-20-7	U	4.0
Chlorobenzene	108-90-7	υ	4.0
1,3,5-trimethylbenzene	108-67-8	U	4.0
1,2,4-trimethylbenzene	95-63-6	U	4.0
1,2,3-trimethylbenzene	526-73-8	U	4.0
1,2,3,4-tetramethylbenzene	488-23-3	U	4.0

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

QUALIFIERS:

- E = Extrapolated value
- U = Compound analyzed for, but not detected.

Surrogate Recovery (\alpha, \alpha, \alpha - Trifluorotoluene):

- B = Compound found in blank and sample. Compare blank and sample data.
- J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available/Not applicable.

Analyst

Approved

89%

70%-130% (QC limits)

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                    1.3.5 Trimethylbenzene
            (J)
                     2.3.1 Tetramethylbenzene ofacj
            i_{\zeta}
            0
Data File Name
                   : C:\HPCHEM\2\DATA\BX20323\021R0801.D
                                                       Page Number
                   : C.J. Cook
                                                                          : 1
Instrument
                                                       Vial Number
                   : BTEX2
                                                                           : 21
Sample Name
                   : X04361 DF=1
                                                       Injection Number: 1
  n Time Bar Code:
                                                       Sequence Line
                                                                          : 8
  quired on
                   : 24 Mar 95
                                  02:07 AM
                                                       Instrument Method: BX20323.MTH
Report Created on: 24 Mar 95
                                  02:32 AM
                                                       Analysis Method : BX20323.MTH
                  : 23 Mar 95
Last Recalib on
                                  03:56 PM
                                                       Sample Amount
                                                       ISTD Amount
Multiplier
                   : Project#: 95-0871 Client#: Trip Blank
```

Water

Sample Info Om alth

Operator

BTEX Data Report Method Blank Report

Client Project No.

: 722450.21020

MacDill AFB

Method Blank Number Date Extracted/Prepared : MB032295

Lab Project No.

: 95-0871

Date Analyzed

: 3/22/95 : 3/22/95

Dilution Factor

: 1.00

Method

: 8020

Matrix

: Water

Lab File No.

: BX2032210

Sample	
--------	--

	Sample	
s Number	Concentration	PQL
	ug/L	ug/L
71-43-2	U	4.0
08-88-3	U	4.0
00-41-4	U	4.0
330-20-7	U	4.0
08-90-7	U	4.0
08-67-8	U	4.0
95-63-6	U	4.0
26-73-8	U	4.0
88-23-3	U	4.0
	ns Number 71-43-2 08-88-3 00-41-4 330-20-7 08-90-7 08-67-8 95-63-6 26-73-8	Concentration ug/L 71-43-2 08-88-3 00-41-4 U 08-90-7 U 08-67-8 U 05-63-6 U

Surrogate Recovery (α, α, α -Trifluorotoluene):

81%

70%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two $\ensuremath{\mathscr{A}}$ which co-elute.

The Xylene PQL is for a single peak.

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

B = Compound found in blank and sample. Compare blank and sample data.

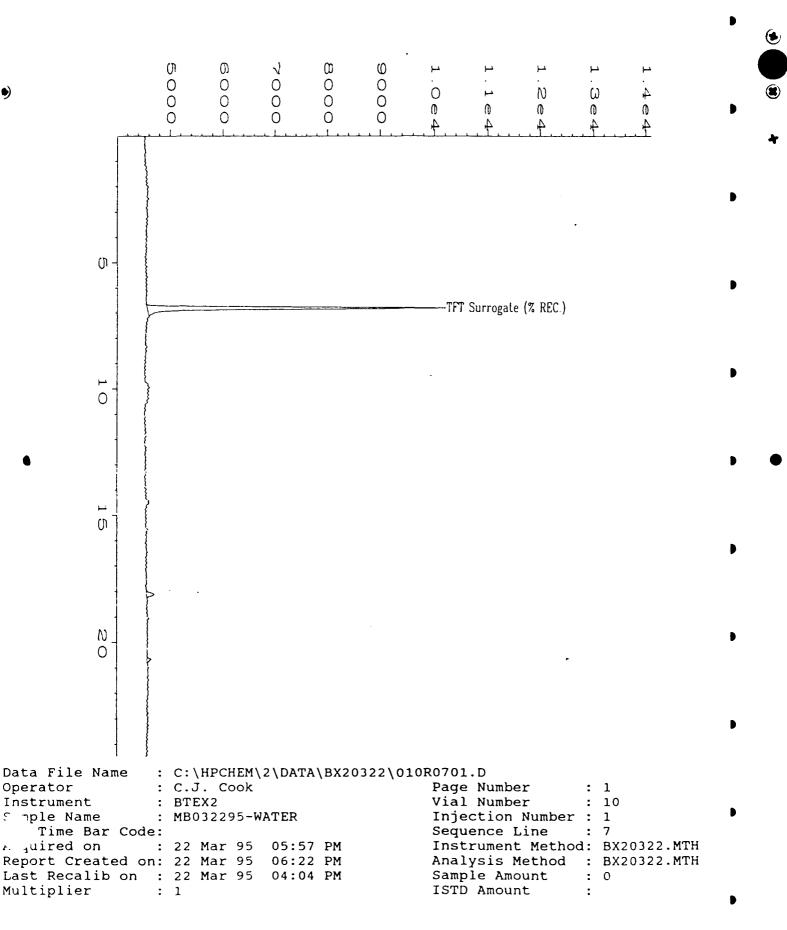
J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

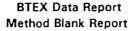
PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available

Analyst

Approved





Client Project No.

: 722450.21020

Method Blank Number : MEB032295

Lab Project No.

MacDill AFB : 95-0871

Date Extracted/Prepared

: 3/22/95

Date Analyzed

: 3/23/95

Dilution Factor

: 125.00

Method Matrix

: 8020

: MeOH Ext.

Lab File No.

: BX2032220

		Sample	
Compound Name	Cas Number	Concentration	PQL
		ug/L	ug/L
Benzene	71-43-2	U	500
Toluene	108-88-3	U	500
Ethyl Benzene	100-41-4	υ	500
Total Xylenes	1330-20-7	υ	500
Chlorobenzene	108-90-7	U	500
1,3,5-trimethylbenzene	108-67-8	U	500
1,2,4-trimethylbenzene	95-63-6	U	500
1,2,3-trimethylbenzene	526-73-8	U	500
1,2,3,4-tetramethylbenzene	488-23-3	U	500

Surrogate Recovery (\alpha, \alpha, \alpha-Trifluorotoluene):

89%

70%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

B = Compound found in blank and sample. Compare blank and sample data.

J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available,

Analyst

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         1.3.5-Trimethylbenzene
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Data File Name
                 : C:\HPCHEM\2\DATA\BX20322\020R0701.D
Operator
                 : C.J. Cook
                                                   Page Number
Instrument
                  : BTEX2
                                                   Vial Number
                                                                  : 20
Sample Name
                                                  Injection Number: 1
Sequence Line: 7
                  : MEB032295
   Time Bar Code:
 _uired on
                 : 23 Mar 95
                               01:23 AM
                                                   Instrument Method: BX20322.MTH
Report Created on: 23 Mar 95
                               01:48 AM
                                                   Analysis Method : BX20322.MTH
Last Recalib on : 22 Mar 95
                               04:04 PM
                                                   Sample Amount
                                                                     : 0
Multiplier
                  : 1
                                                   ISTD Amount
```

Dm 4/5/95

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BTEX Data Report Method Blank Report

Method Blank Number : MB032395 Client Project No.

: 722450.21020

Date Extracted/Prepared

Lab Project No.

MacDill AFB : 95-0871

Date Analyzed

: 3/23/95 : 3/23/95

Dilution Factor

: 1.00

Method Matrix

: 8020

: Water

Lab File No.

: BX2032310

Samp	Эle
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		Sample	
Compound Name	Cas Number	Concentration	PQL
		ug/L	ug/L
Benzene	71-43-2	U	4.0
Toluene	108-88-3	U	4.0
Ethyl Benzene	100-41-4	U	4.0
Total Xylenes	1330-20-7	U	4.0
Chlorobenzene	108-90-7	U	4.0
1,3,5-trimethylbenzene	108-67-8	U	4.0
1,2,4-trimethylbenzene	95-63-6	U	4.0
1,2,3-trimethylbenzene	526-73-8	U	4.0
1,2,3,4-tetramethylbenzene	488-23-3	U	4.0

Surrogate Recovery (\alpha, \alpha, \alpha - Trifluorotoluene):

90%

70%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

B = Compound found in blank and sample. Compare blank and sample data.

J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available.

Analyst

BTEX Data Report Laboratory Control Sample (LCS)

LCS Number : LCS032295 Dilution Factor : 1.00 Method : 602 Date Extracted/Prepared : 3/22/95 Date Analyzed : 3/22/95 Matrix : Water Spike Amount (ug/L) : 40.0 Lab File No. : BX2032211

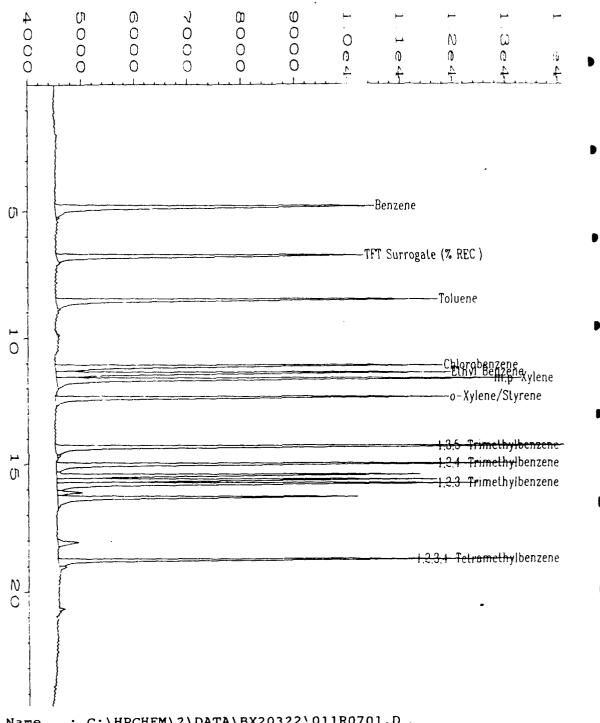
Compound Name	Cas Number	LCS Concentration ug/L	LCS % 'Recovery	QC Limit % Recovery
Benzene	71-43-2	36.8	92.0%	57.5%-110.0%
Toluene	108-88-3	34.6	86.5%	65.0%-107.5%
Ethyl Benzene	100-41-4	34.7	86.8%	65.0%-120.0%
m,p-Xylene	NA	34.1	85.3%	62.5%-117.5%
o-Xylene	95-47-6	33.7	84.3%	65.0%-120.0%
Chlorobenzene	108-90-7	34.3	85.8%	70.0%-115.0%
1,3,5-trimethylbenzene	108-67-8	35.5	88.8%	60.0%-117.5%
1,2,4-trimethylbenzene	95-63-6	29.1	72.8%	57.5%-115.0%
1,2,3-trimethylbenzene	526-73-8	34.3	85.8%	72.5%-122.5%
1,2,3,4-tetramethylbenzene	488-23-3	33.5	83.8%	NA
Surrogate Recovery (α,α,α-Trifluo	rotoluene):	82%	70%-1309	% (QC limits)

QUALIFIERS:

- E = Extrapolated value
- U = Compound analyzed for, but not detected.
- B = Compound found in blank and sample. Compare blank and sample data.
- J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

NA = Not available/Not analyzed

Approved



: C:\HPCHEM\2\DATA\BX20322\011R0701.D Data File Name Page Number Operator : C.J. Cook Vial Number : BTEX2 Instrument Injection Number: 1 LCS032295 Sample Name : 7 Sequence Line Run Time Bar Code: Instrument Method: BX203 06:41 PM Acquired on : 22 Mar 95 : BX20322.MI Analysis Method 07:06 PM Report Created on: 22 Mar 95 Sample Amount : 0 Last Recalib on : 22 Mar 95 04:04 PM ISTD Amount Multiplier : 1

TD Amount .

BTEX Data Report Laboratory Control Sample (LCS)

LCS Number : LCS032395 Dilution Factor : 1.00 Date Extracted/Prepared : 3/23/95 Method : 602 Date Analyzed : 3/23/95 Matrix : Water Spike Amount (ug/L) : 40.0 Lab File No. : BX2002311

Compound Name	Cas Number	LCS Concentration ug/L	LCS % Recovery	QC Limit % Recovery
Benzene	71-43-2	36.9	92.3%	57.5%-110.0%
Toluene	108-88-3	35.6	89.0%	65.0%-107.5%
Ethyl Benzene	100-41-4	36.0	90.0%	65.0%-120.0%
m,p-Xylene	NA	36.6	91.5%	62.5%-117.5%
o-Xylene	95-47-6	34.2	85.5%	65.0%-120.0%
Chlorobenzene	108-90-7	35.4	88.5%	70.0%-115.0%
1,3,5-trimethylbenzene	108-67-8	37.0	92.5%	60.0%-117.5%
1,2,4-trimethylbenzene	95-63-6	30.1	75.3%	57.5%-115.0%
1,2,3-trimethylbenzene	526-73-8	35.6	89.0%	72.5%-122.5%
1,2,3,4-tetramethylbenzene	488-23-3	35.5	88.8%	NA
Surrogate Recovery (α,α,α-Trifluo	rotoluene):	98%	70%-130%	6 (QC limits)

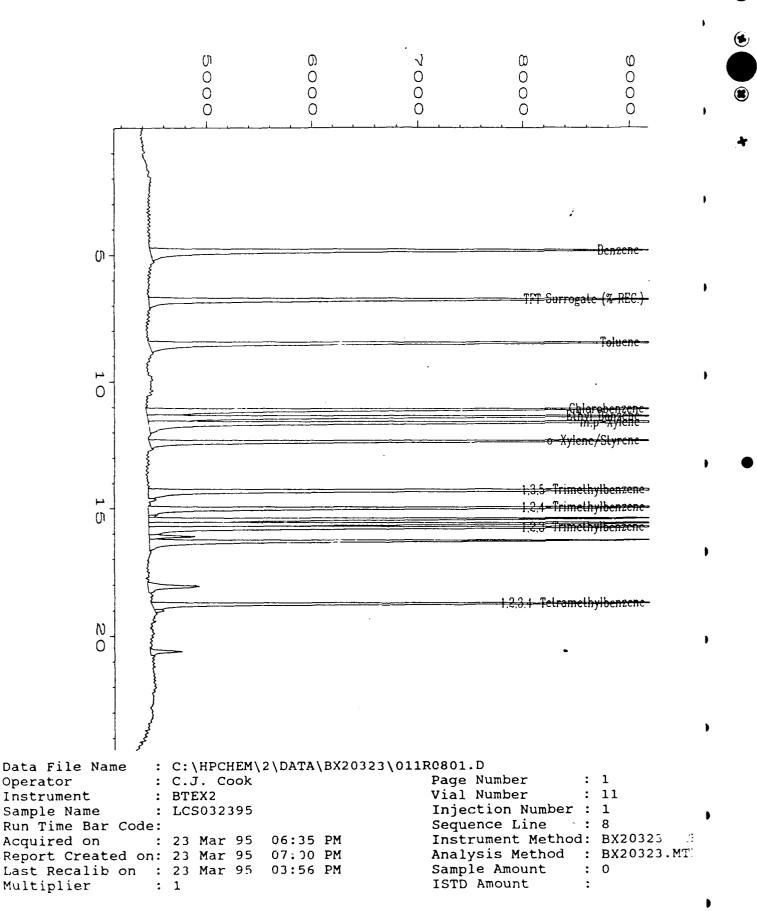
QUALIFIERS:

- E = Extrapolated value
- U = Compound analyzed for, but not detected.
- B = Compound found in blank and sample. Compare blank and sample data.
- J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

NA = Not available/Not analyzed

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Approved



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External Standard Report `ata File Name : C:\HPCHEM\2\DATA\BX20323\\08\R0801.D perator : C.J. Cook Page Number : 1 Vial Number : 8 / Page Number : BTEX2 Instrument Sample Name : 1.0 ppb BTEX MIX Injection Number: 1 Run Time Bar Code: Sequence Line : 8 Acquired on : 23 Mar 95 04:17 PM Instrument Method: BX20323.MTH Report Created on: 23 Mar 95 04:42 PM Analysis Method : BX20323.MTH Last Recalib on : 23 Mar 95 03:56 PM Sample Amount : 0 : 1 ISTD Amount Multiplier : STD REF #1644, 3/10/95, 0.5 UG/ML (M & P-XYLENE PRESENT); + Sample Info 1,2,3 & 1,2,4-Trimethylbenzene Sig. 2 in C:\HPCHEM\2\DATA\BX20323\008R0801.D Ret Time Area Type Width Ref# ug/L 2.452 * not found * 1 0.095 1 662 BV 3.204 Benzene 4.902 0.105 1-R 98.651 TFT Surrogate (% REC.) 6.798 35775 PV 2.805 Toluene 0.092 1 8.555 667 BV 645 BV 0.106 1 2.661 Chlorobenzene 11.180 0.096 1 1.394 Ethyl Benzene 11.435 783 PV 1791 VV 0.094 -0.189 m,p-Xylene 11.680 1 0.077 665 PV 1.854 o-Xylene/Styrene 12.400 1 1.380 1,3,5-Trimethylbenzene 1.950 1,2,4-Trimethylbenzene 0.113 1763 PV 14.340 1 0.080 2270 PV 15.038 1 15.240 * not found * 1 0.083 2.307 15.567 636 BV 1

Time Reference Peak Expected RT Actual RT Difference 3 6.750 6.798 0.048

0.077 1

0.062 1

1

0.698 1,2,3-Trimethylbenzene

0.938 1,2,3,4-Tetramethylbenzene

Not all calibrated peaks were found

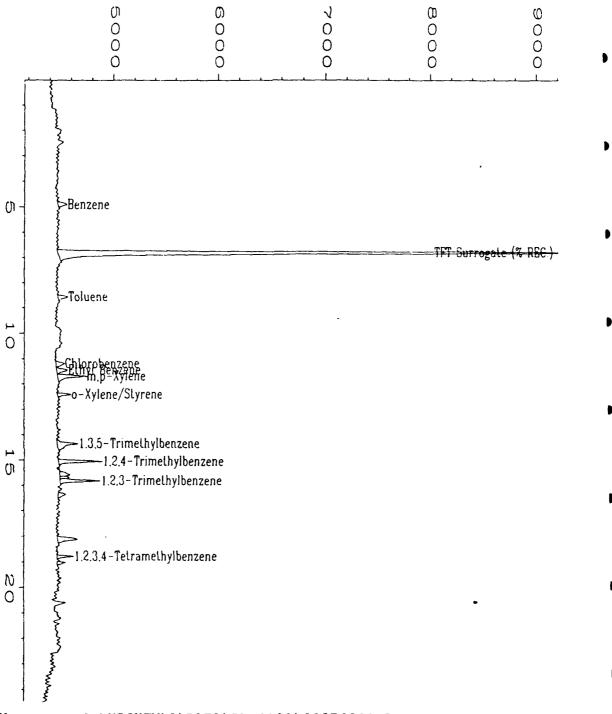
16.089 * not found *

2097 VV

689 BV

915.803

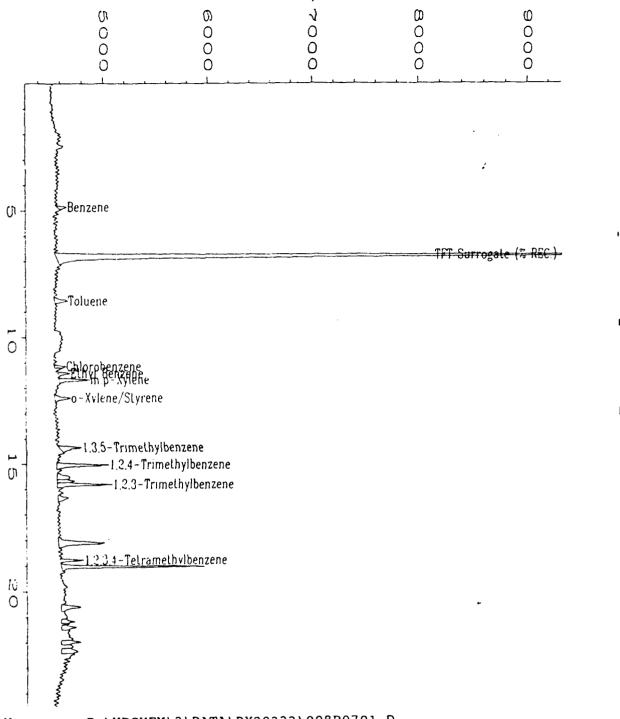
18.764



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Data File Name
                 : C:\HPCHEM\2\DATA\BX20323\008R0801.D
Operator
                 : C.J. Cook
                                                 Page Number
Instrument
                   BTEX2
                                                 Vial Number
Sample Name
                   1.0 ppb BTEX MIX
                                                 Injection Number: 1
Run Time Bar Code:
                                                 Sequence Line
                                                                   : 8
Acquired on
                 : 23 Mar 95
                               04:17 PM
                                                 Instrument Method: BX20323...[]
Report Created on: 23 Mar 95
                               04:42 PM
                                                 Analysis Method : BX20323.MT
Last Recalib on : 23 Mar 95
                                                 Sample Amount
                                                                   : 0
Multiplier
                                                 ISTD Amount
Sample Info
                 : STD REF #1644, 3/10/95, 0.5 UG/ML (M & P-XYLENE PRESENT);
                   1,2,3 & 1,2,4-Trimethylbenzene
```

External Standard Report Pata File Name : C:\HPCHEM\2\DATA\BX20322\008R0701.D •) erator : C.J. Cook Page Number : BTEX2 instrument Vial Number Sample Name : 1.0 ppb BTEX MIX Injection Number: 1 Run Time Bar Code: Sequence Line : 7 Acquired on : 22 Mar 95 04:24 PM Instrument Method: BX20322.MTH Report Created on: 23 Mar 95 08:56 AM Analysis Method : BX20322.MTH Last Recalib on : 22 MAR 95 04:04 PM Sample Amount Multiplier : 1 ISTD Amount Sample Info : STD REF #1644, 3/10/95, 0.5 UG/ML (M & P-XYLENE PRESENT); + 1,2,3 & 1,2,4-Trimethylbenzene Sig. 2 in C:\HPCHEM\2\DATA\BX20322\008R0701.D Ret Time Area Type Width Ref# ug/L Name |-----|-----|-----|-----|-----| 2.452 * not found * 1 4.860 438 PV 0.067 1 1.864 Benzene 6.789 1-R 87.650 TFT Surrogate (% REC.) 39381 PV 0.099 1 8.562 933 PV 0.094 1.820 Toluene 11.144 534 BV 1.698 Chlorobenzene 0.069 1 0.064 1 11.428 529 PV 0.289 Ethyl Benzene 11.672 1477 BV 0.077 1 -2.219 m,p-Xylene 12.389 0.093 1 1035 BV 1.133 o-Xylene/Styrene 14.332 0.103 1 -0.0133 1,3,5-Trimethylbenzene 1481 BV 15.022 2932 BV 0.083 1 1.035 1,2,4-Trimethylbenzene 15.240 * not found * 5.484 1180 PV 0.154 1 4.187 **●**5.799 2933 VV 0.079 1 0.0762 1,2,3-Trimethylbenzene 16.330 794 VV 0.105 1 10.218 18.764 0.059 1 948 VV 0.600 1,2,3,4-Tetramethylbenzene Time Reference Peak Expected RT Actual RT Difference 3 6.750 6.789 0.039

Not all calibrated peaks were found



```
: C:\HPCHEM\2\DATA\BX20322\008R0701.D
Data File Name
                                                Page Number
                 : C.J. Cook
Operator
                                                Vial Number
                 : BTEX2
Instrument
                                                Injection Number:
                 : 1.0 ppb BTEX MIX
Sample Name
                                                Sequence Line
Run Time Bar Code:
                                                Instrument Method: BX20322.
                              04:24 PM
Acquired on
                 : 22 Mar 95
                                                Analysis Method : BX20322.MT
Report Created on: 22 Mar 95
                              04:50 PM
                                                Sample Amount
                                                                  : 0
                : 22 Mar 95
                              04:04 PM
Last Recalib on
                                                 ISTD Amount
Multiplier
                 : STD REF #1644, 3/10/95, 0.5 UG/ML (M & P-XYLENE PRESENT);
Sample Info
```

1,2,3 & 1,2,4-Trimethylbenzene

TOTAL VOLATILE HYDROCARBONS (TVH)

Date Sampled : 3/13-1

: 3/13-15/95

Client Project Number

: 722450.21020/MACDILL AFB

Date Received
Date Prepared

: 3/17/95 : 3/22,23/95 Lab Project Number Matrix

: 95-0871 : Soil

Date Analyzed

: 3/22,23/95 : 3/22,23/95

Method Number

: 5030/Mod.8015

Evergreen	Client	Surrogate	TVH+	RL*
Sample #	Sample #	Recovery	_ mg/Kg	mg/Kg
MB032295	METHOD BLANK	100%	U	0.
MB032395	METHOD BLANK	99%	U	0.1
X04339	75MP-2(2-4)	131%	3000E	6.0
X04340	75MP-2(8-10)	102%	U	0.12
X04341	75SS-3(3-4)	102%	U	0.12
X04342	75SS-3(8-10)	107%	U	0.12
X04344	75MP-3(3-5)	100%	U	0.12
X04345	75MP-4(8-10)	97%	U	0.12
X04346	75MP-4(13-15)	99%	U	0.12
X04347	75MP-5(4-6)	93%	U	0.12
X04348	75MP-5(6-8)	98%	U	0.12
X04348 DUP	75MP-5(6-8)	100%	U	0.12
X04349	75SS-15(4-6)	112%	U	0.12
X04350	75SS-6(3-5)	100%	U	0.12
X04351	75SS-6(7-9)	88%	U	0.12
X04351 DUP	75SS-6(7-9)	89%	U	0.12
X04352	75SS-6(22-24)	89%	3.0	0.12
X04353	75SD-1	102%	U	0.11
X04354	75SD-2	100%	U	0.11
X04355	75SD-3	99%	U	0.11
X04360	75MP-7(6-8)	97%	U	0.12

^{* =} Based on dry weight.

QUALIFIERS

U = TVH analyzed for but not detected.

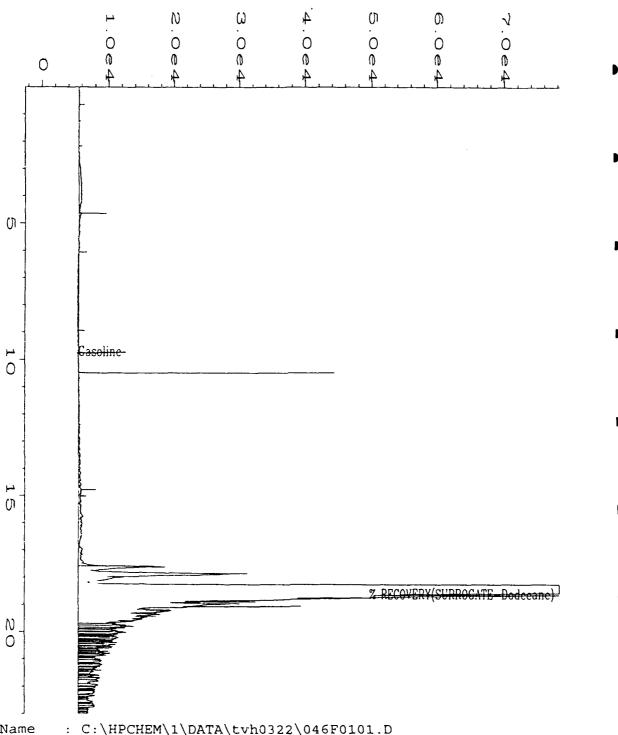
B = TVH found in blank as well as sample (blank data should be compared).

E = Extrapolated value.

RL = Reporting Limit

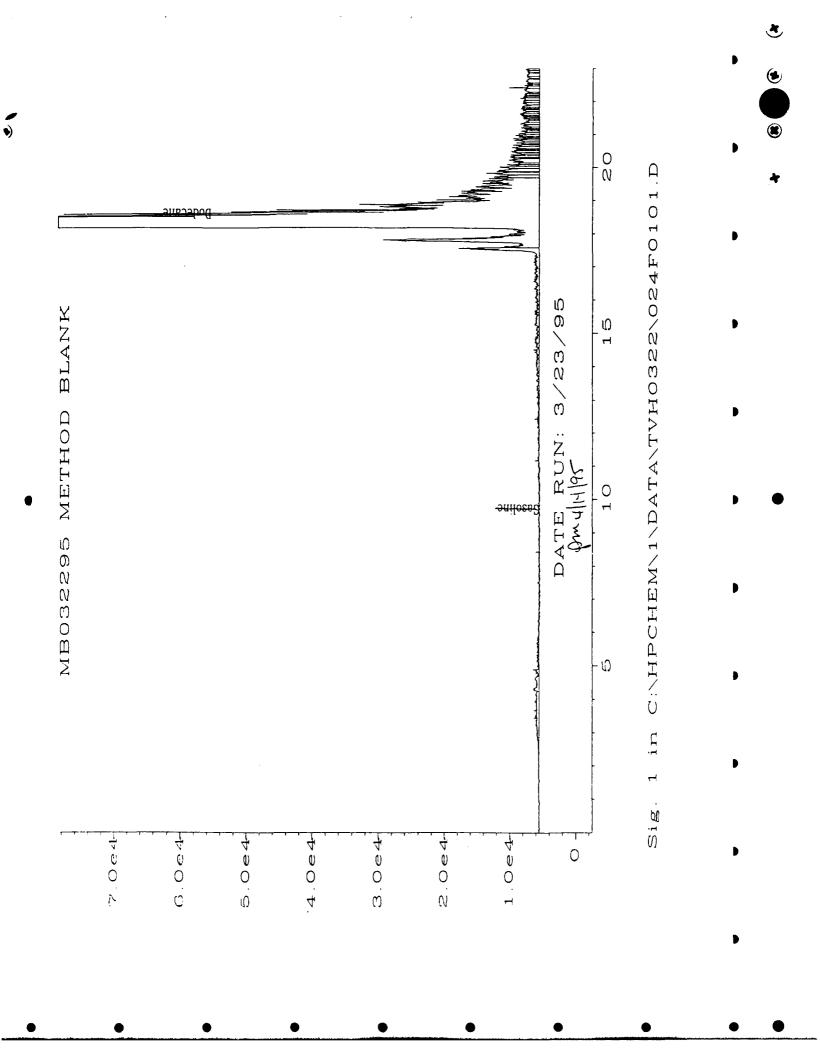
Approved

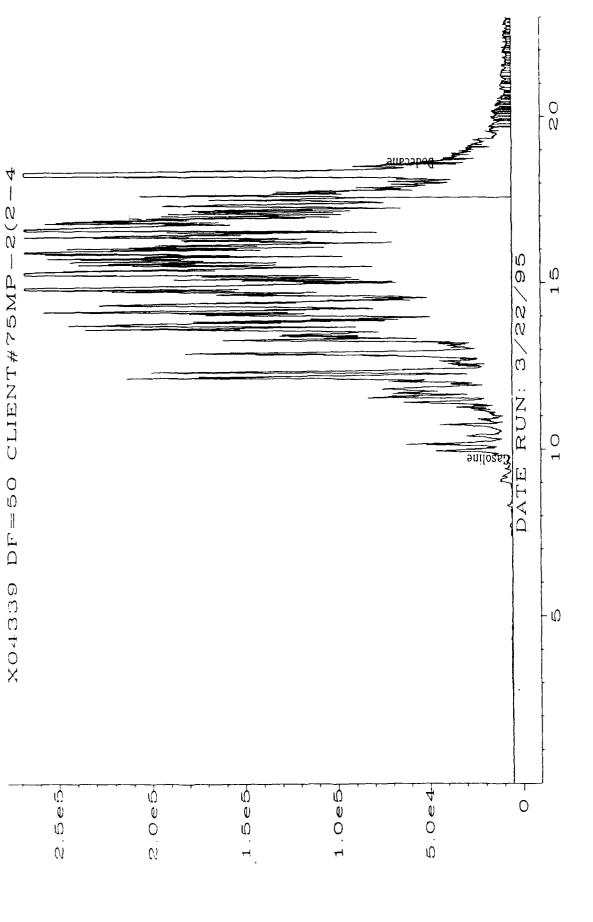
Analyst



Data File Name : C:\HPCHEM\1\DATA\tvh0322\046F0101.D Operator : Dawn N. Guildner Page Number TVH 3 3m MB0 22395 Instrument Vial Number : 46 Sample Name Injection Number : 1 Run Time Bar Code: Sequence Line : 1 Acquired on : 23 Mar 95 03:47 PM Instrument Method: TVH1BASE... Report Created on: 23 Mar 95 09:22 PM Analysis Method : TVH0322.MT Last Recalib on : 23 MAR 95 12:18 PM Sample Amount : 0 Multiplier ISTD Amount

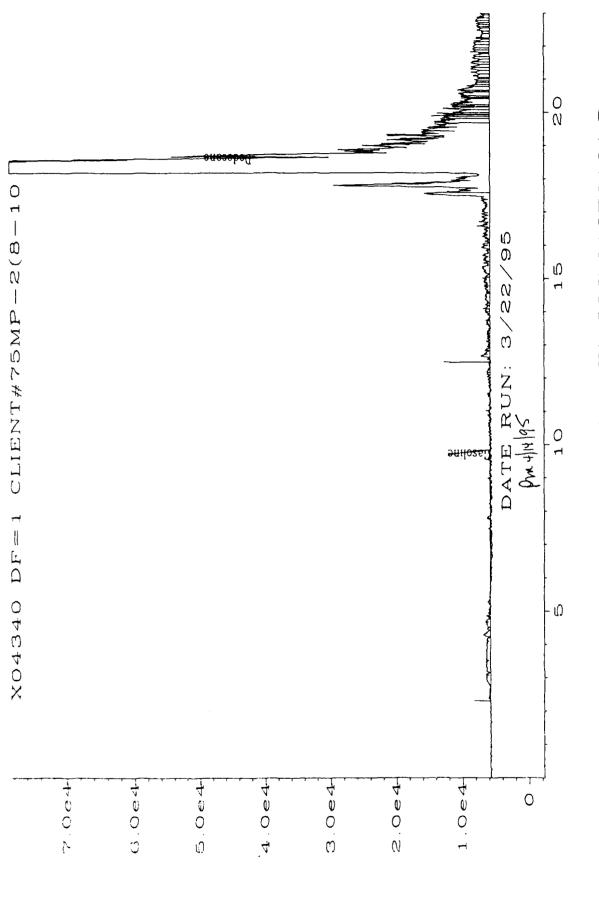
fm 4/14/95





C:\HPCHEM\1\DATA\TVH0322\017F0101.D in Sig.

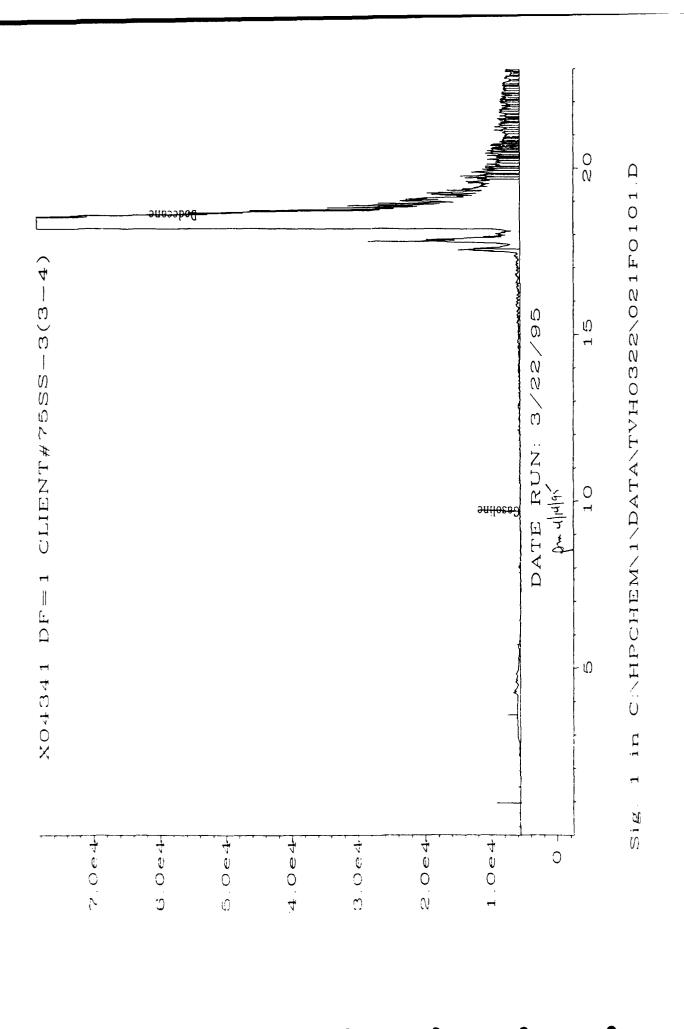
3



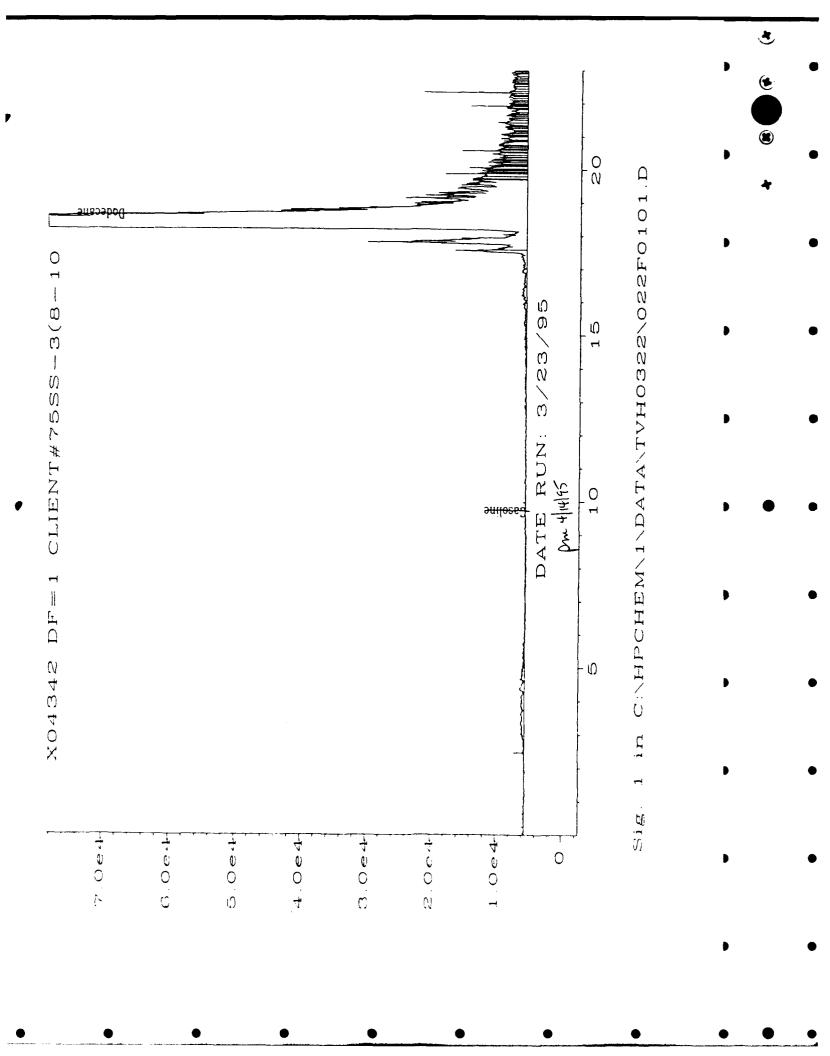
C:\HPCHEM\1\DATA\TVH0322\018F0101.D in Sig.

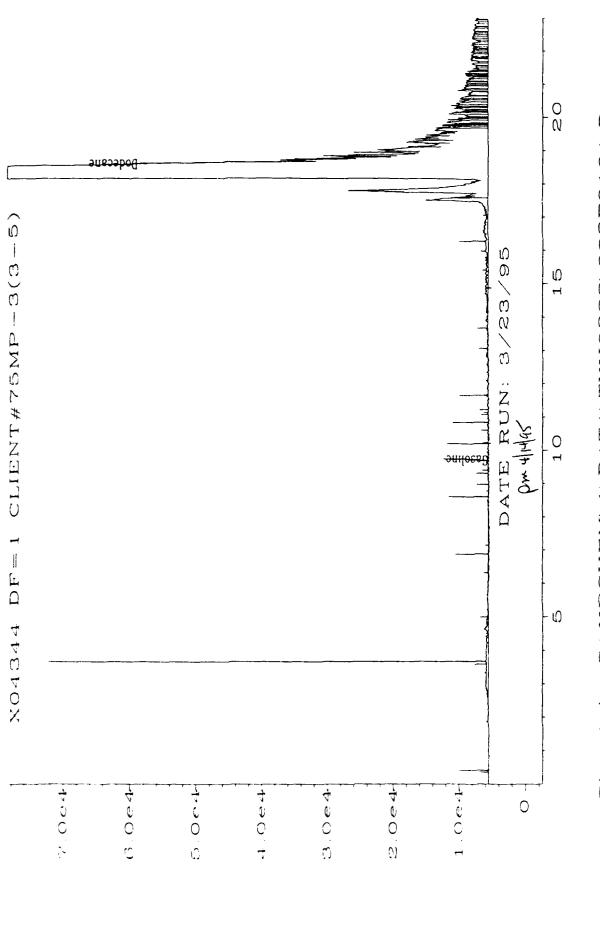
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8

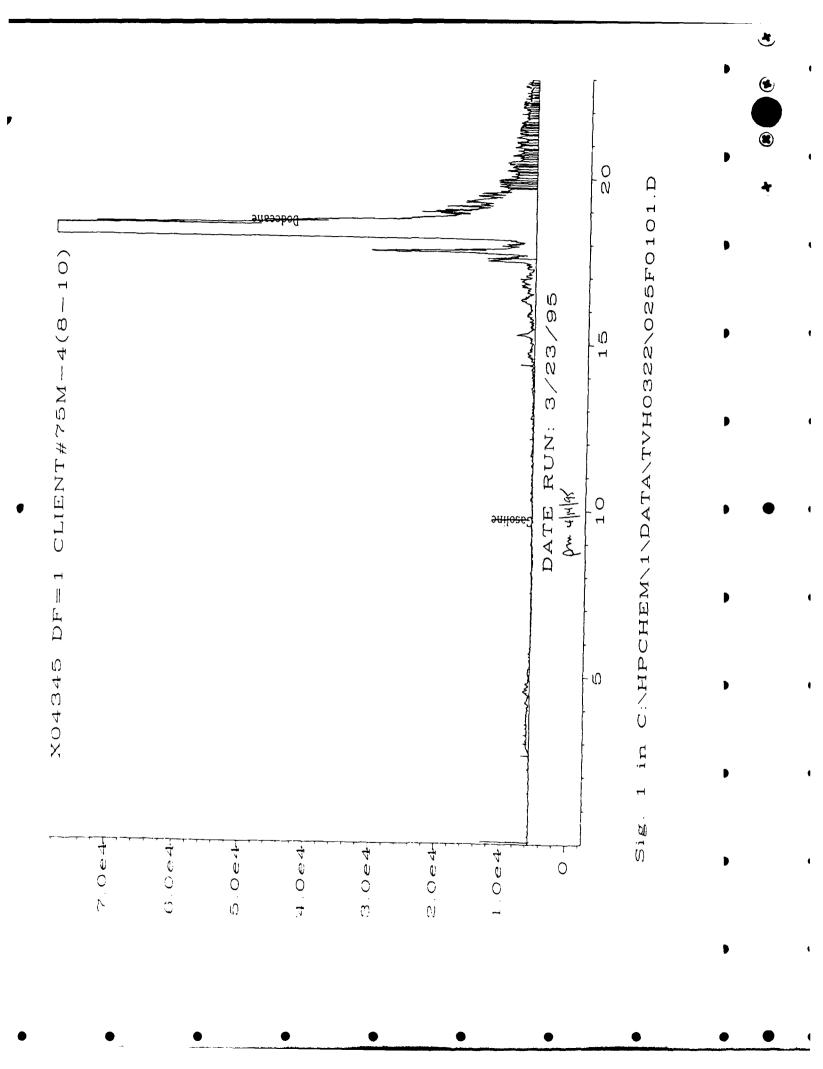


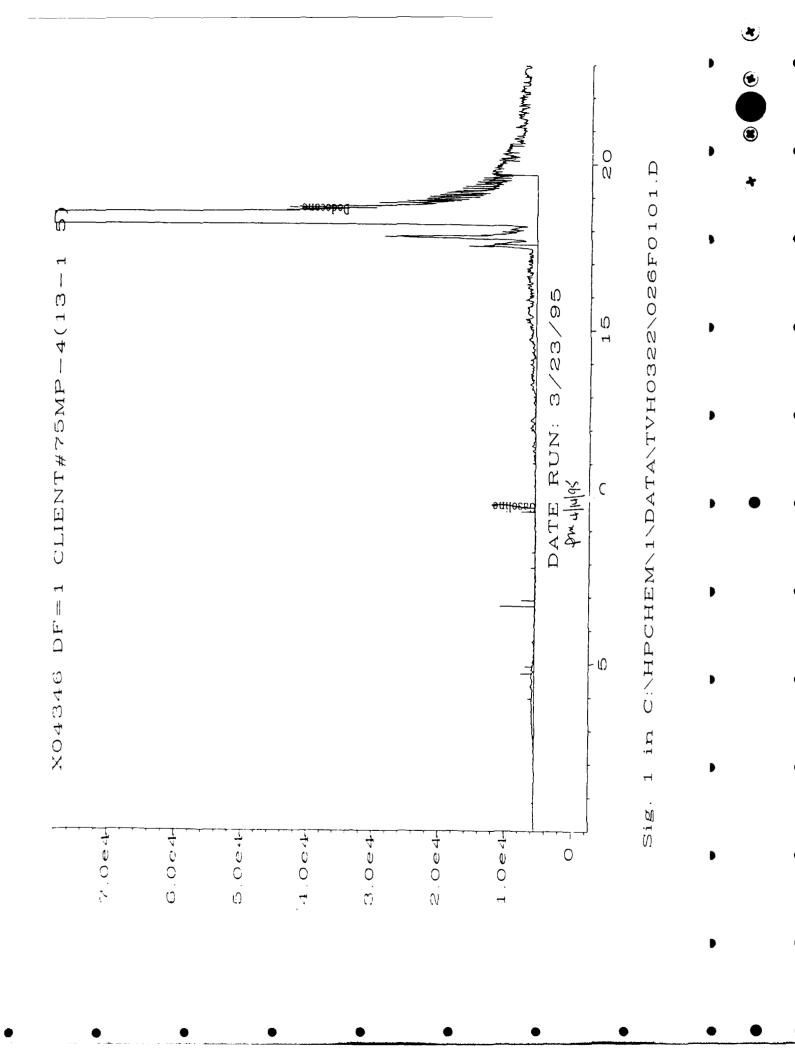
<u>*</u>

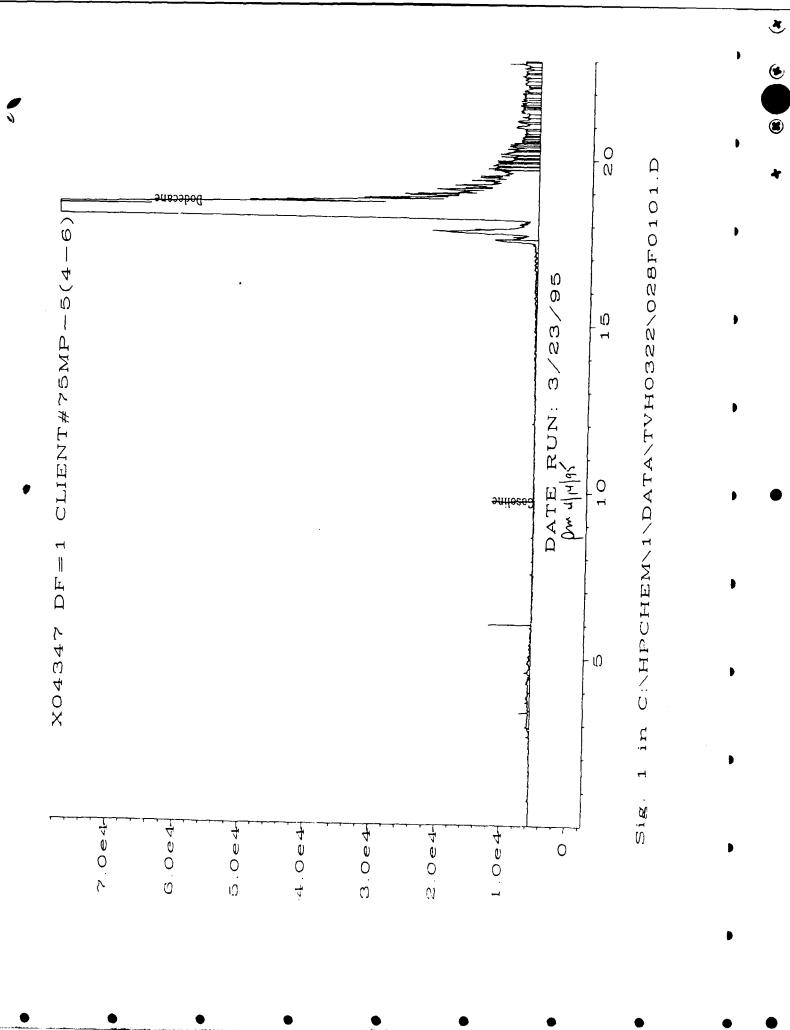


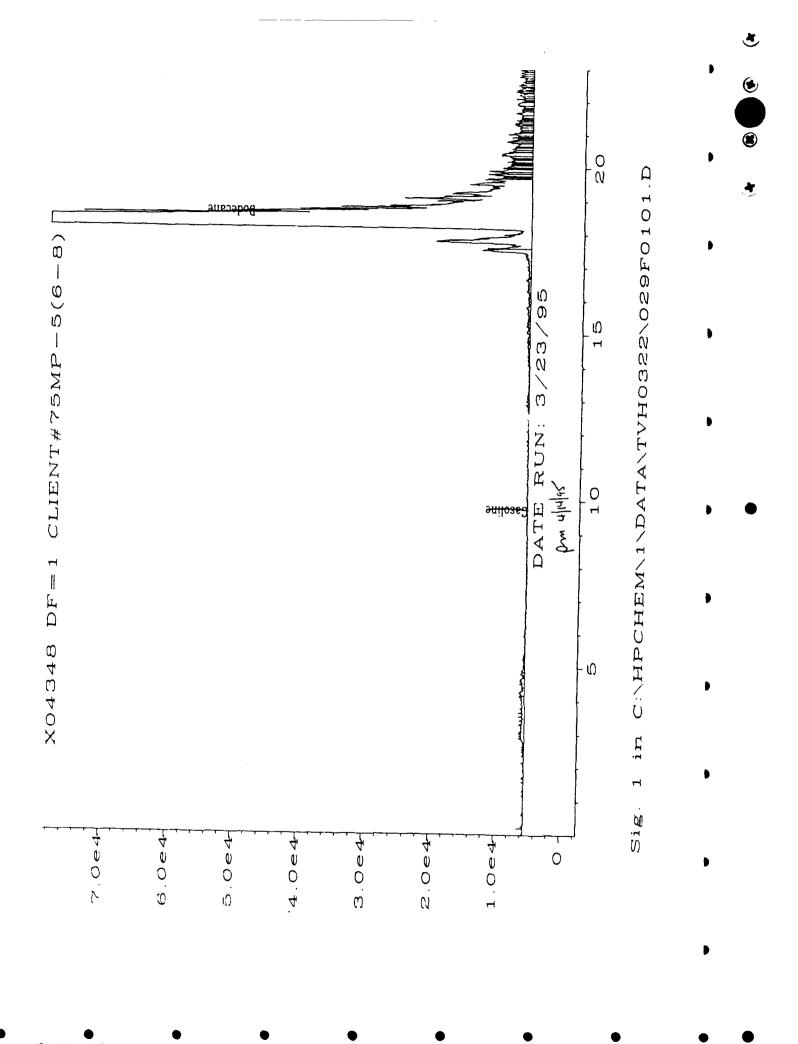


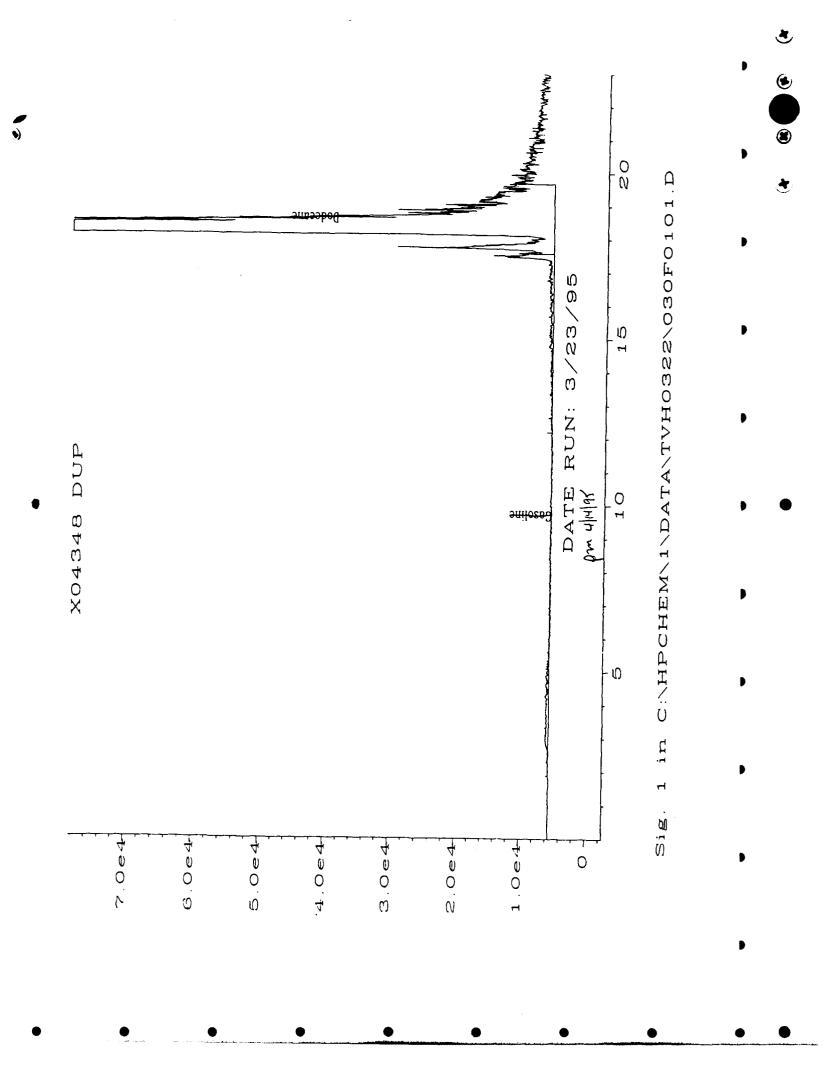
C:\HPCHEM\1\DATA\TVH0322\023F0101.D i L SiB

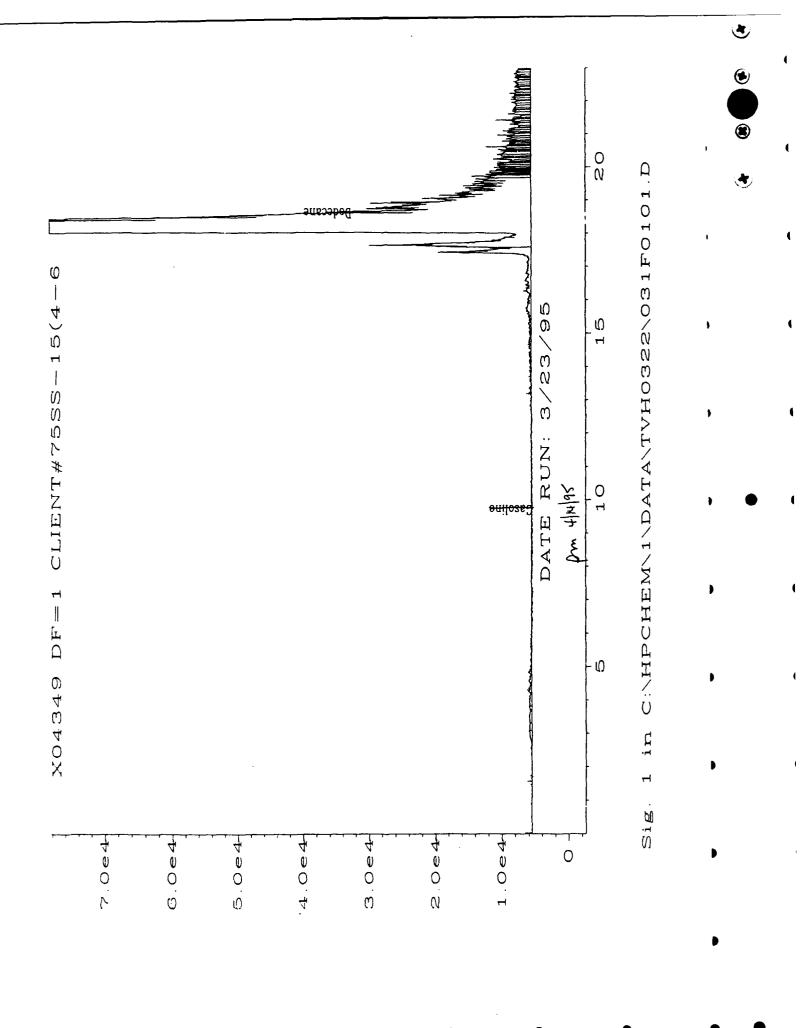


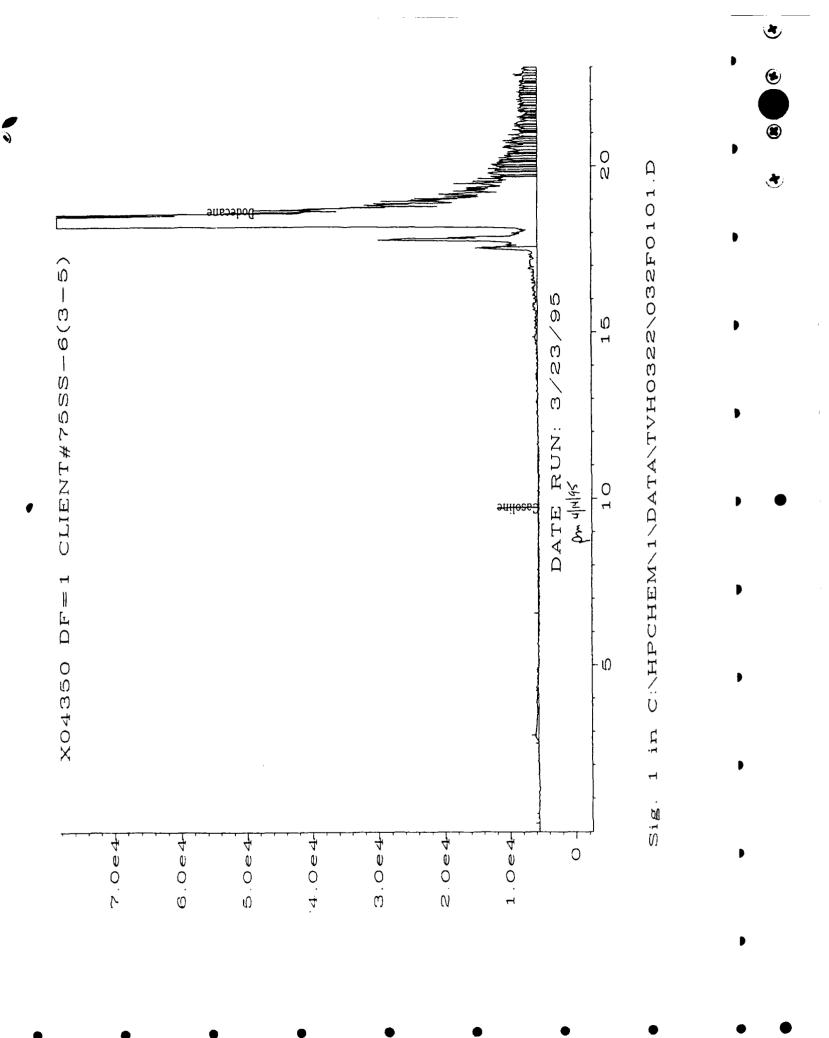


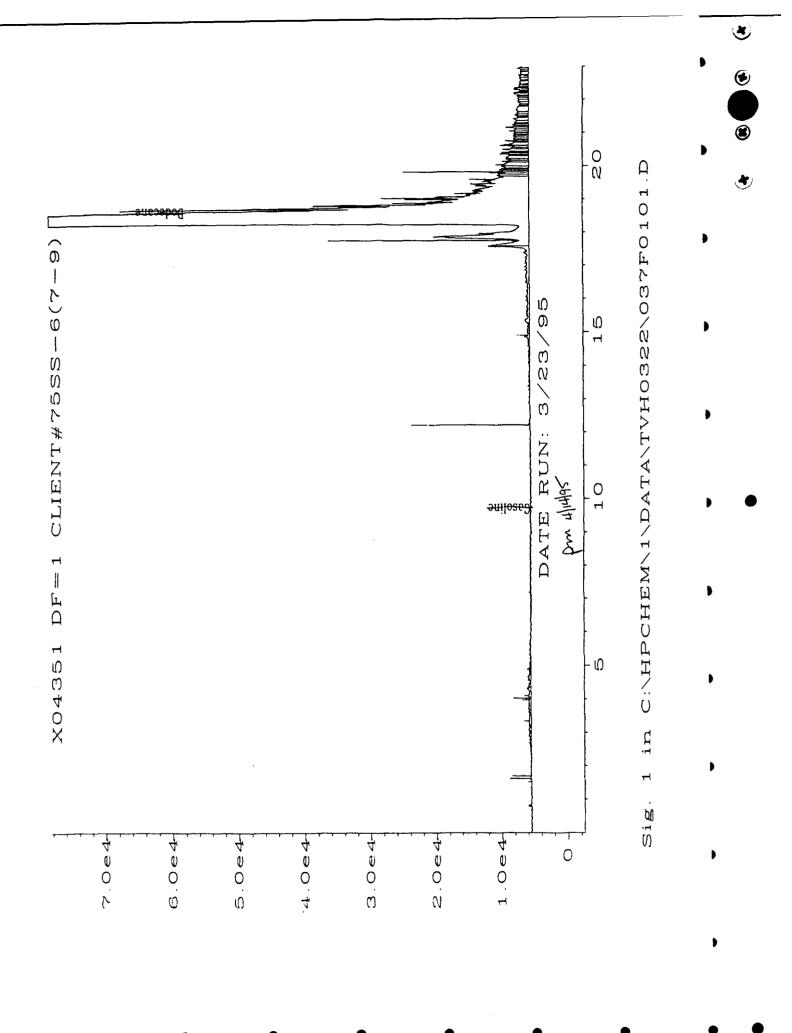


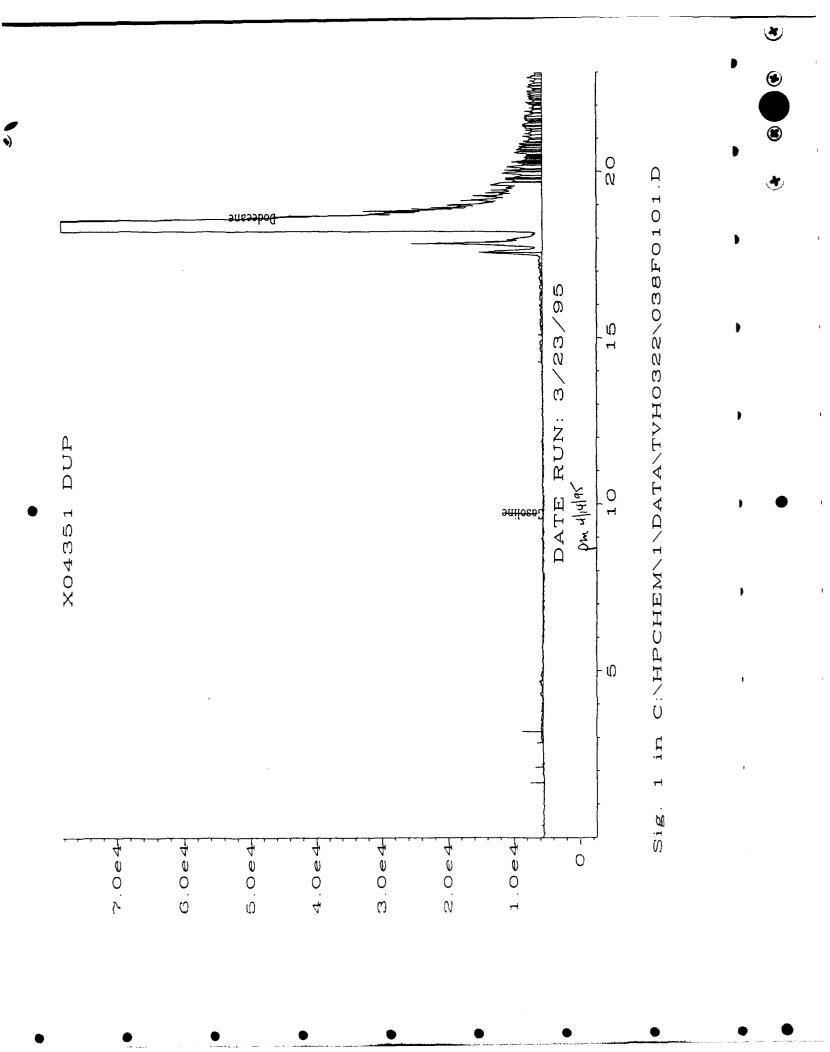


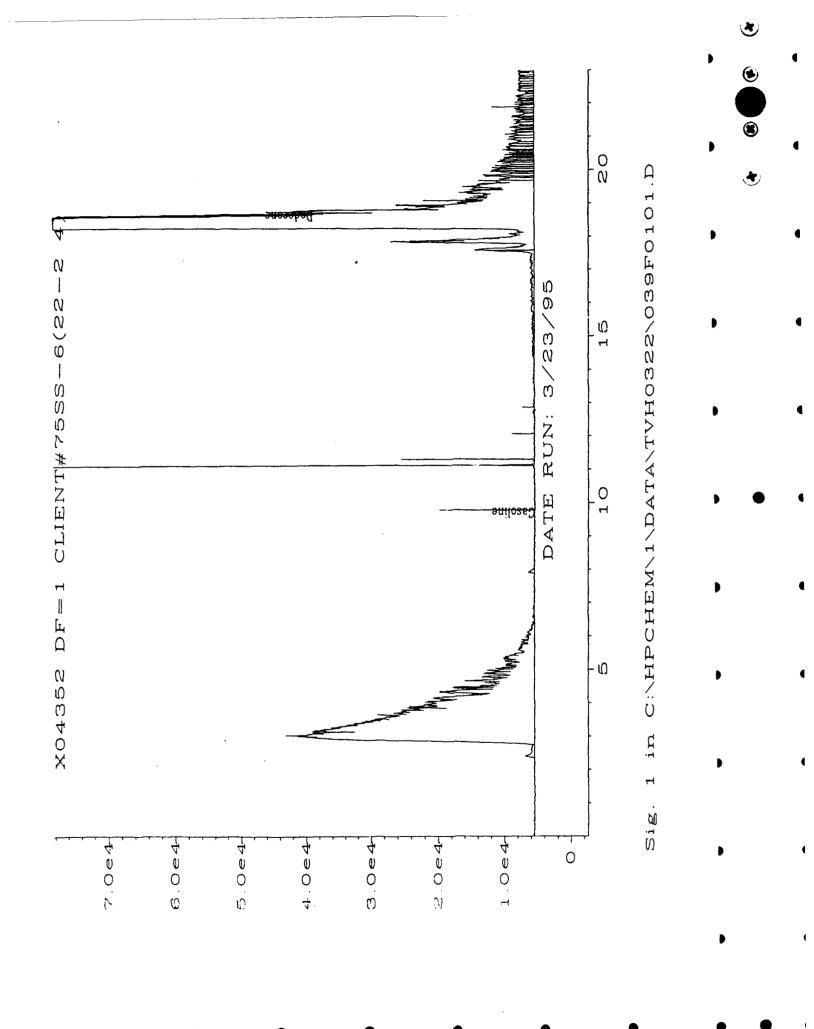


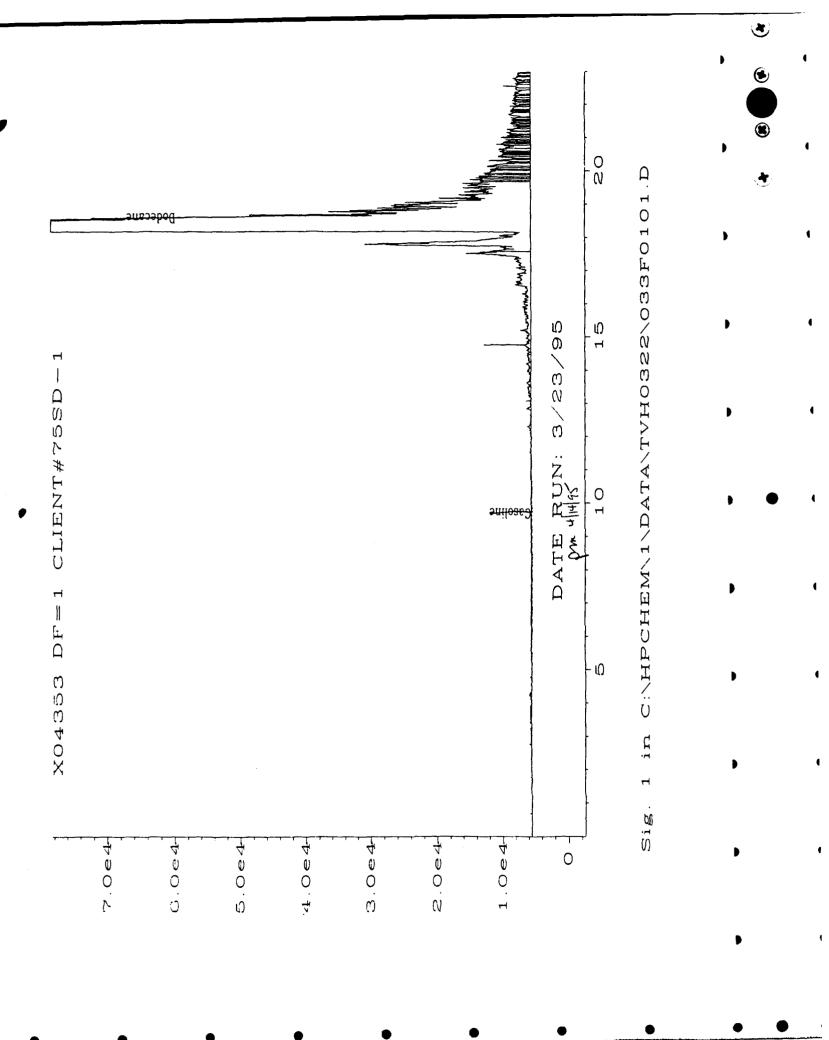


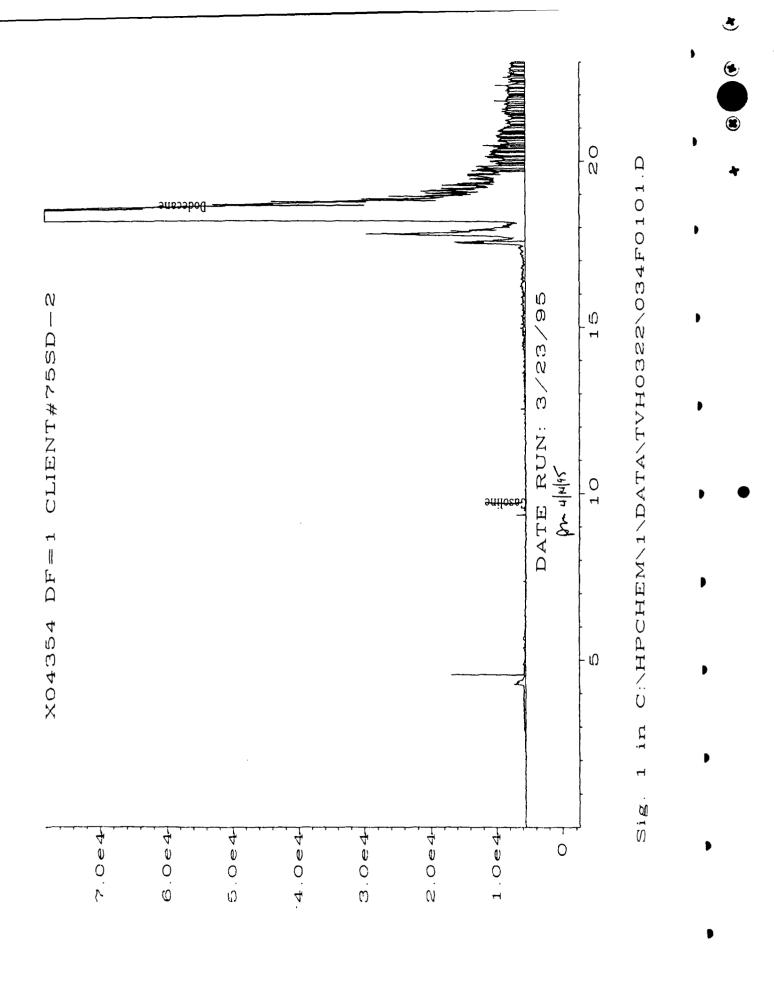


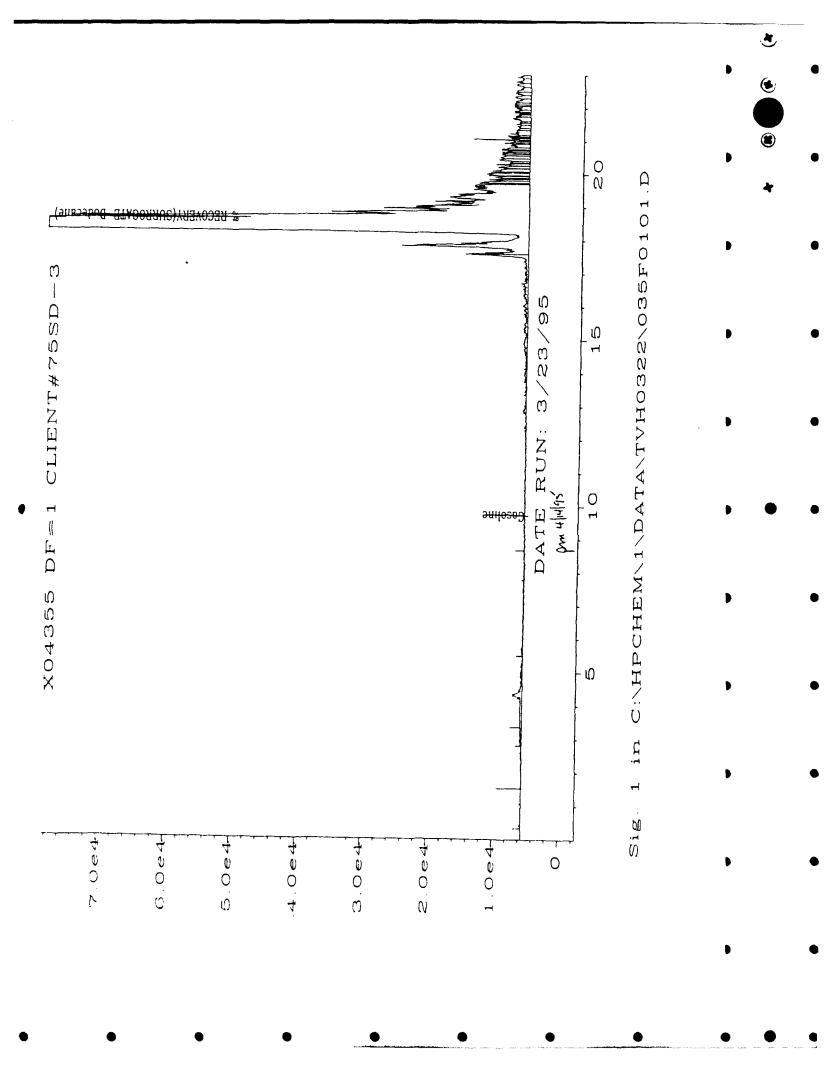


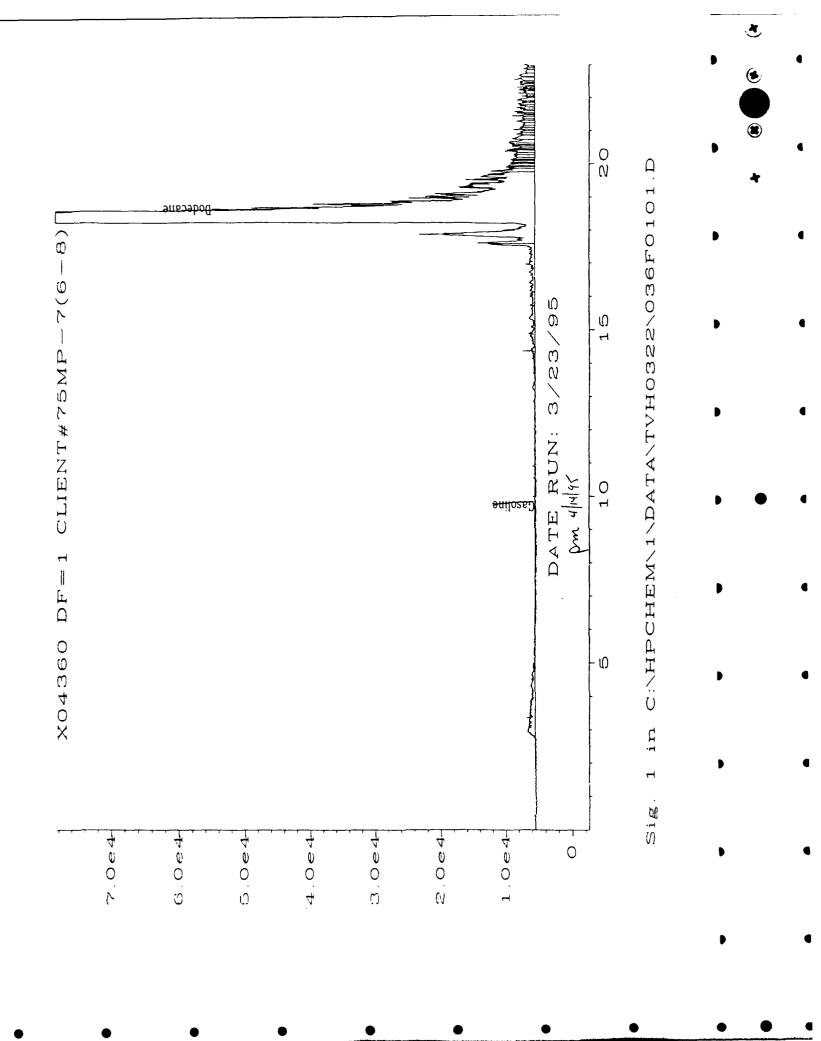
















TOTAL VOLATILE HYDROCARBONS (TVH) Laboratory Control Sample (LCS)

LCS Number

: LCS032295

Client Project Number

: 722450.21020/MACDILL AFB

Date Prepared

: 3/22/95

Lab Project Number

: 95-0871 : SOIL

Date Analyzed Sequence Number : 3/22/95

: TVH7

Matrix Method Number

: 5030/MOD. 8015

		LCS	
Compound Name	Theoretical Concentration mg/L	Concentration mg/L	QC Limit mg/L
Gasoline	5.00	6.30	3.5-6.5

QUALIFIERS

U = TEH analyzed for but not detected.

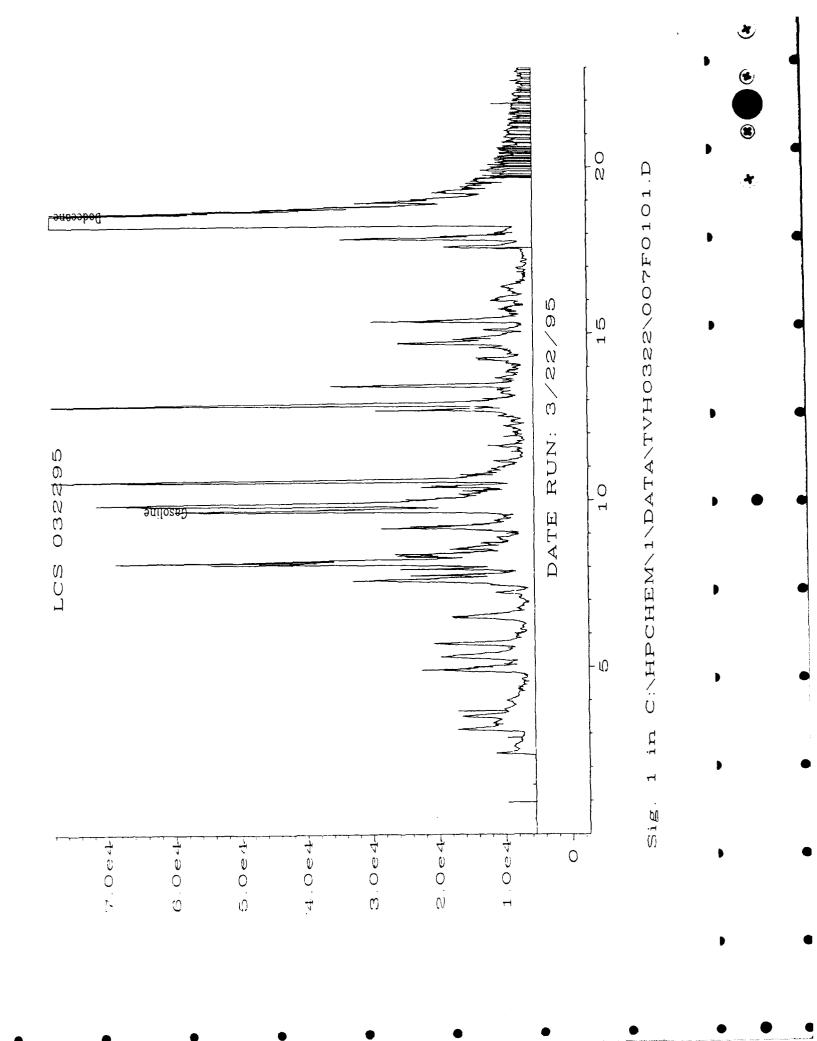
B = TEH found in blank as well as sample (blank data should be compared).

E = Extrapolated value.

NA = Not Available.

Analyst

Approved







TOTAL EXTRACTABLE HYDROCARBONS (TEH) Jet Fuel

Date Sampled

: 3/13-15/95

Client Project Number

: 722450.21020/MACDILL AFB

Date Received
Date Prepared

: 3/17/95

Lab Project Number

: 95-0871

Date Prepared

: 3/20,21/95

Matrix

: Soil

Date Analyzed

: 3/24-25/95

Method Number

: 3500/Mod. 8015

Evergreen	Client	TEH *	RL*	
Sample # Sample #		Recovery	mg/Kg	mg/Kg
SB032095	SOIL METHOD BLANK	96%	U	10
SB032195	SOIL METHOD BLANK	110%	U	10
X04340	75MP-2(8-10)	94%	17	12
X04341	75SS-3(3-4)	94%	U	12
X04342	75\$\$-3(8-10)	91%	U	12
X04342 DUP	75SS-3(8-10)	90%	U	12
X04344	75MP-3(3-5)	92%	U	12
X04347	75MP-5(4-6)	88%	U	12
X04349	75SS-15(4-6)	93%	U	12
X04350	75SS-6(3-5)	89%	U	12
X04351	75SS-6(7-9)	108%	U	12
X04351 DUP	75SS-6(7-9)	109%	U	12
X04339	75MP-2(2-4)	79%	4000	580

QUALIFIERS

U = TEH analyzed for but not detected.

B = TEH found in blank as well as sample (blank data should be compared).

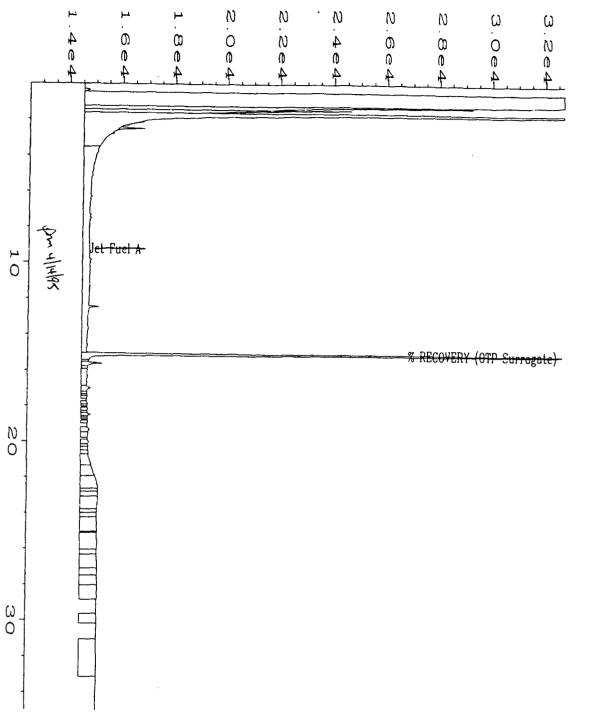
E = Extrapolated value.

RL = Reporting Limit

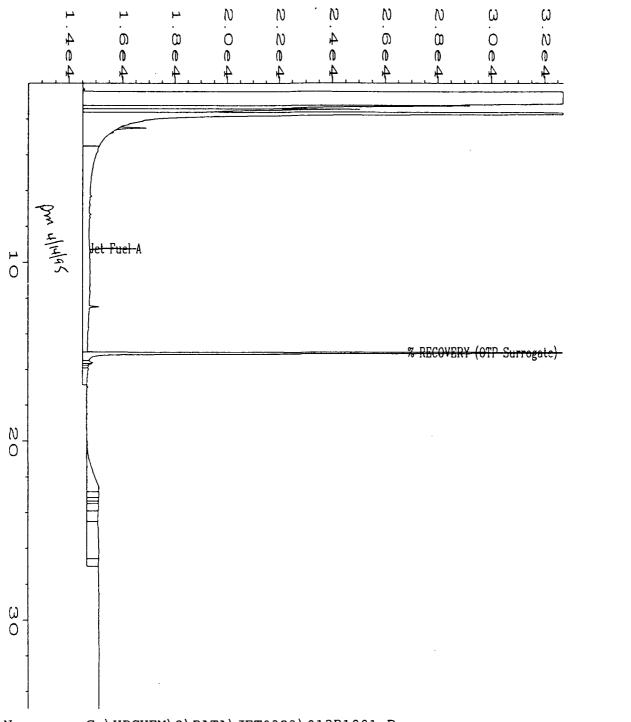
Analyst

Annroyed

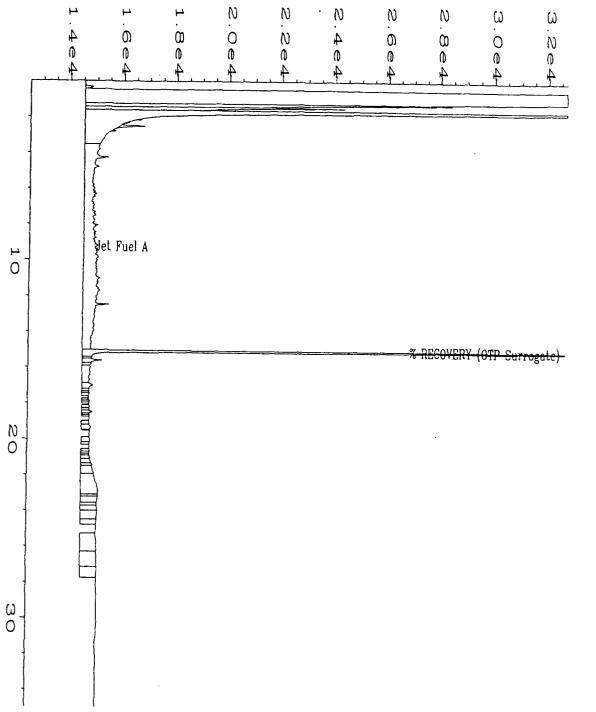
^{* =} Based on dry weight.



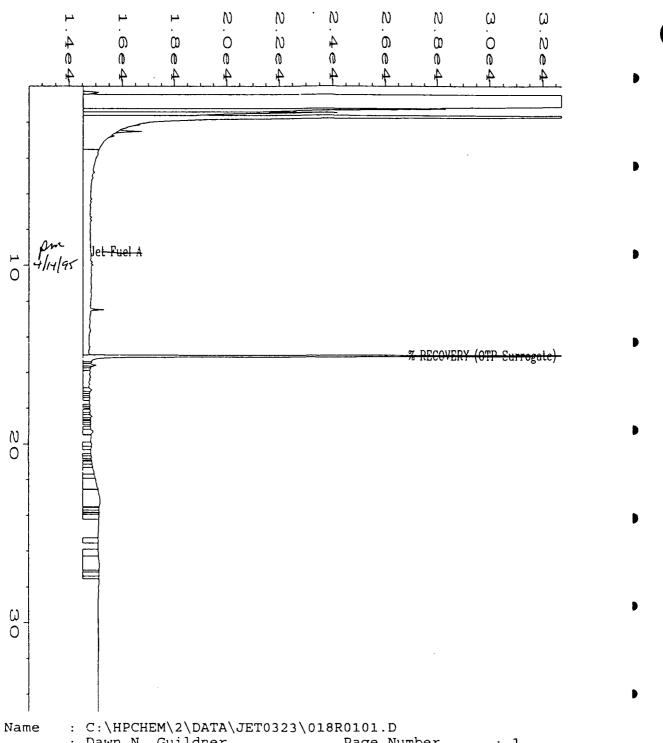
<pre>Operator : Instrument : Sample Name :</pre>	SB032095	R1001.D Page Number : Vial Number : Injection Number :	10
Report Created on:	24 Mar 95 07:06 AM 24 Mar 95 09:25 AM 24 Mar 95 08:06 AM	Sequence Line : Instrument Method: Analysis Method : Sample Amount : ISTD Amount :	JET0323 .: JET0323.MT: 0



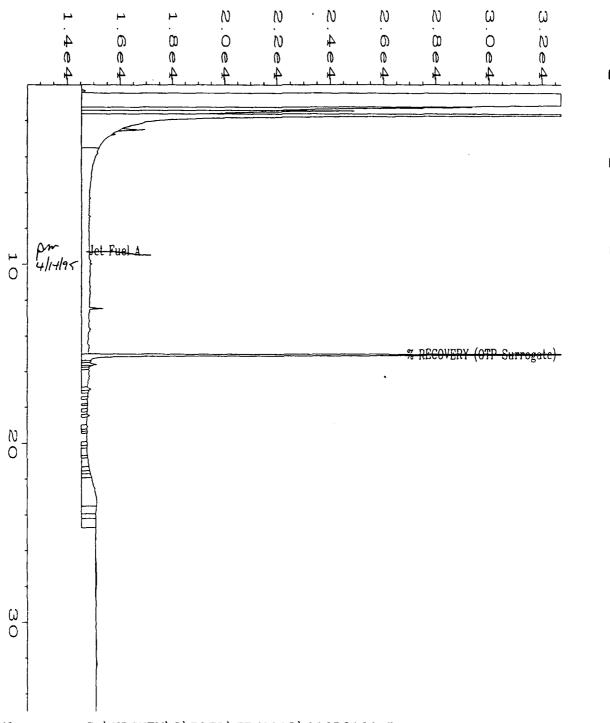
Data File Name : C:\HPCHEM\2\DATA\JET0323\012R1001.D Operator : Dawn N. Guildner Page Number : 12 Instrument : TEH Vial Number : SB032195 Injection Number: 1 Sample Name Sequence Line in Time Bar Code: : 10 Instrument Method: JET0323.MTH equired on : 24 Mar 95 08:46 AM Analysis Method : JET0323.MTH Report Created on: 24 Mar 95 09:30 AM Last Recalib on : 24 Mar 95 08:06 AM Sample Amount Multiplier ISTD Amount



Data File Name : Operator : Instrument : Sample Name : Run Time Bar Code:	X04340 DF=1 Injection Number: 1	
Acquired on : Report Created on: Last Recalib on : Multiplier :	Sequence Line : 1 24 Mar 95 11:15 AM	3 3.MT



Data File Name Operator : Dawn N. Guildner Page Number Vial Number Instrument : TEH : 18 Sample Name : X04341 DF=1 Injection Number: 1 'n Time Bar Code: Sequence Line Instrument Method: JET0323.MTH Analysis Method : JET0323.MTH Last Recalib on : 24 MAR 95 08:06 AM Sample Amount Multiplier ISTD Amount : 1 : Project # 95-0871 Client # 75SS-3(3-4) Sample Info

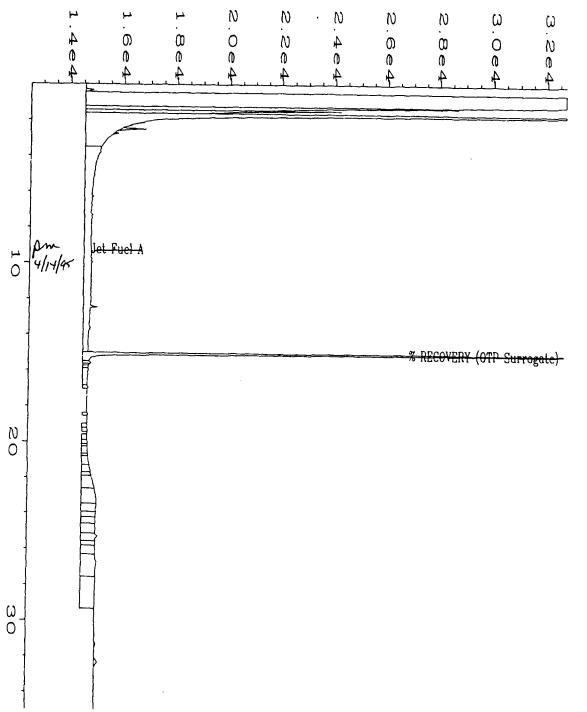


```
Data File Name
                  : C:\HPCHEM\2\DATA\JET0323\019R0101.D
Operator
                  : Dawn N. Guildner
                                                    Page Number
Instrument
                                                    Vial Number
                                                                      : 19
                  : TEH
Sample Name
                  : X04342 DF=1
                                                    Injection Number: 1
Run Time Bar Code:
                                                    Sequence Line
                                                                      : 1
Acquired on : 24 Mar 95 02:34 PM Report Created on: 24 Mar 95 03:10 PM
                                                    Instrument Method: JET032.
                                                    Analysis Method : JET0323.MT
Last Recalib on : 24 MAR 95 08:06 AM
                                                    Sample Amount
                                                    ISTD Amount
Multiplier
                  : 1
                  : Project # 95-0871 Client # 75SS-3(8-10)
Sample Info
```

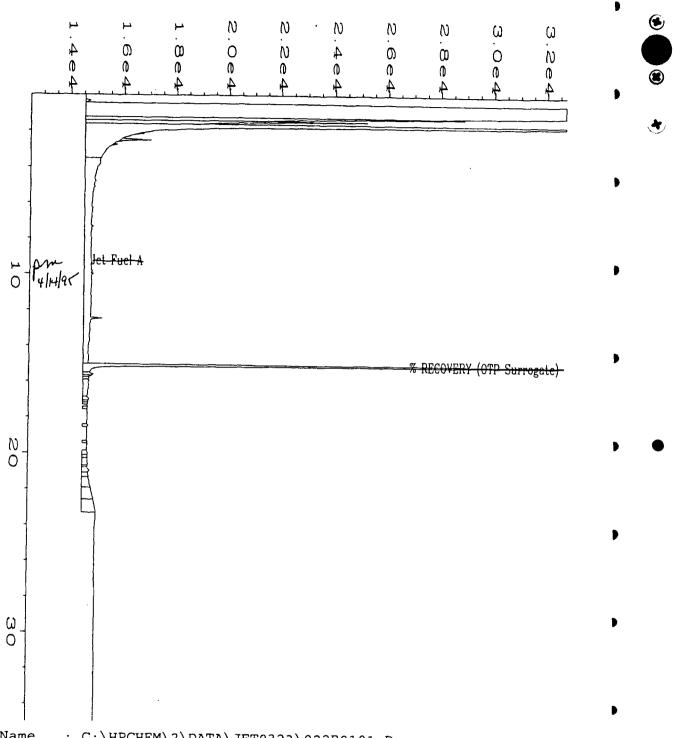
. . .

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.

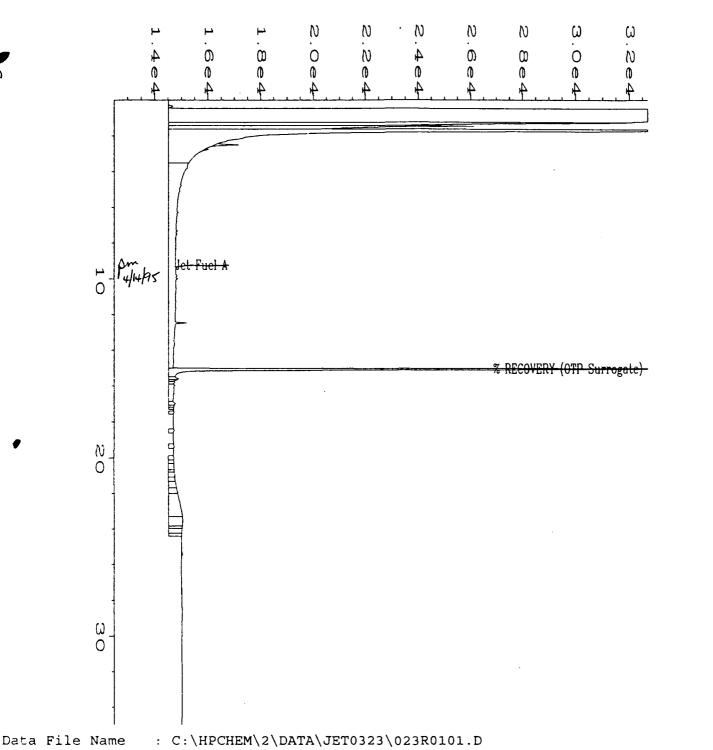


: C:\HPCHEM\2\DATA\JET0323\020R0101.D Data File Name Operator : Dawn N. Guildner Page Number Instrument : TEH Vial Number : 20 Sample Name : X04342 Dupl. Injection Number: 1 Run Time Bar Code: Sequence Line : 1 `uired on : 24 Mar 95 03:24 PM Instrument Method: JET0323.MTH . Fort Created on: 24 Mar 95 04:00 PM Analysis Method : JET0323.MTH Last Recalib on : 24 MAR 95 08:06 AM Sample Amount Multiplier : 1 ISTD Amount Sample Info : Project # 95-0871 Client # 75SS-3(8-10)



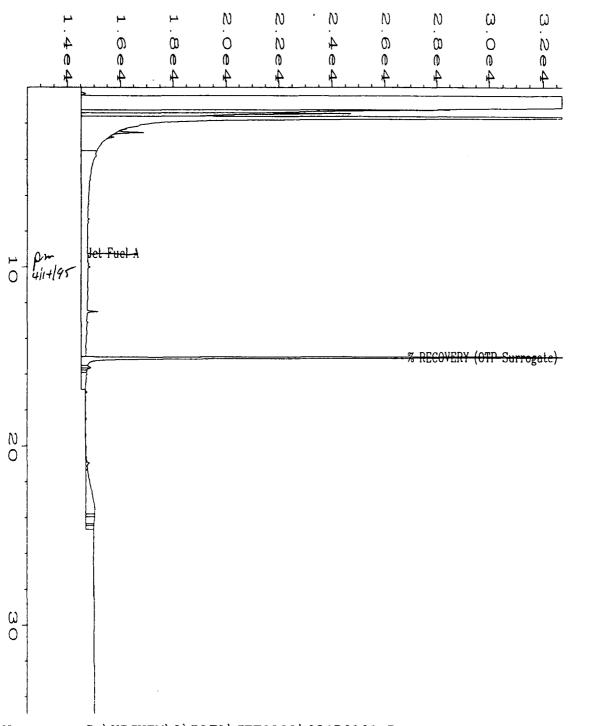
Operator Instrument Sample Name Run Time Bar Code:	Sequence Line	22 1
Report Created on: Last Recalib on : Multiplier :	24 Mar 95 05:04 PM Instrument Method: 24 Mar 95 05:39 PM Analysis Method: 24 MAR 95 08:06 AM Sample Amount: 1 ISTD Amount: Project # 95-0871 Client # 75MP-3(3-5) Soil	JET032: 1 JET0323.MT

*

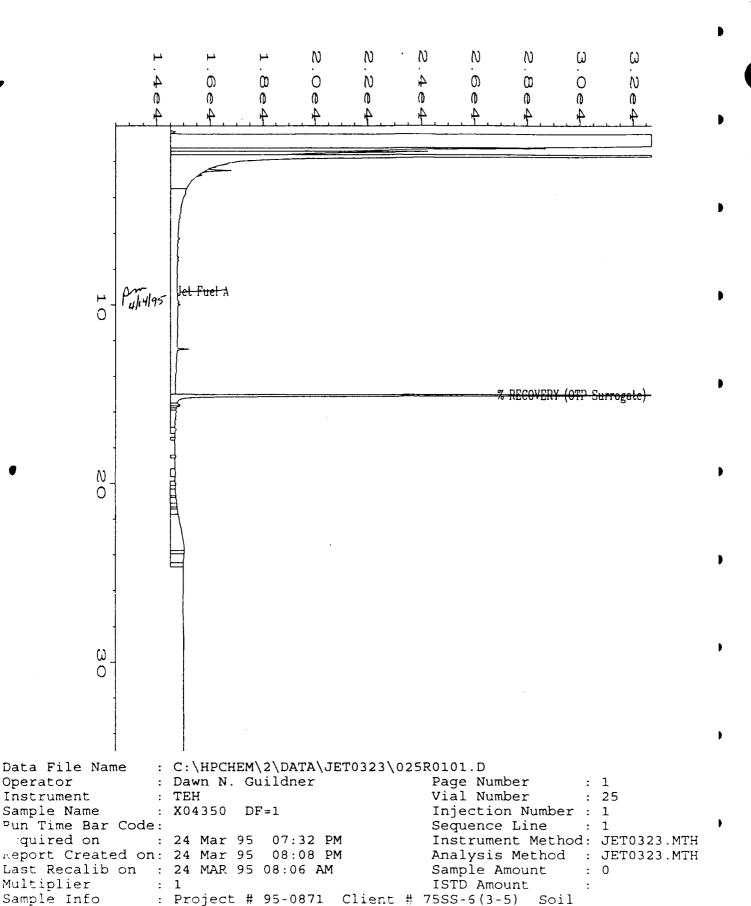


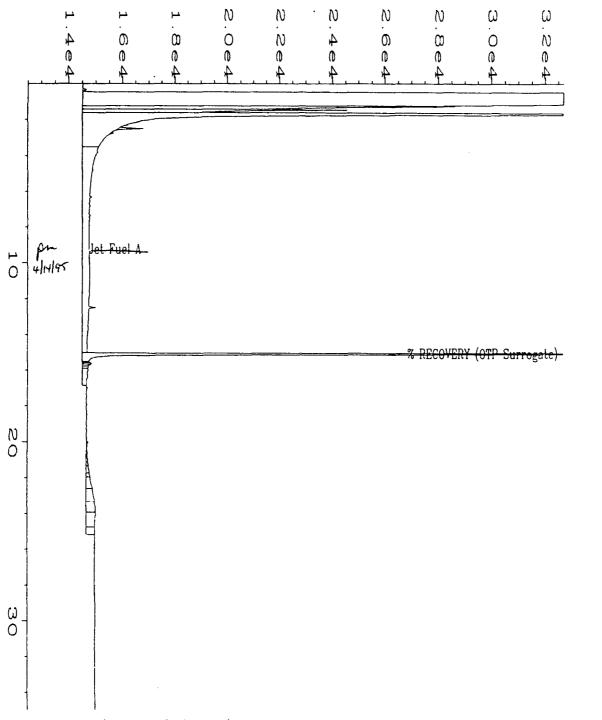
*

Operator : Dawn N. Guildner Page Number : TEH Instrument Vial Number : 23 : X04347 DF=1 Injection Number : 1 Sample Name : 1 Tun Time Bar Code: Sequence Line quired on : 24 Mar 95 05:53 PM Report Created on: 24 Mar 95 06:29 PM Instrument Method: JET0323.MTH Analysis Method : JET0323.MTH Last Recalib on : 24 MAR 95 08:06 AM Sample Amount ISTD Amount Multiplier : 1 Sample Info : Project # 95-0871 Client # 75MP-5(4-6) Soil

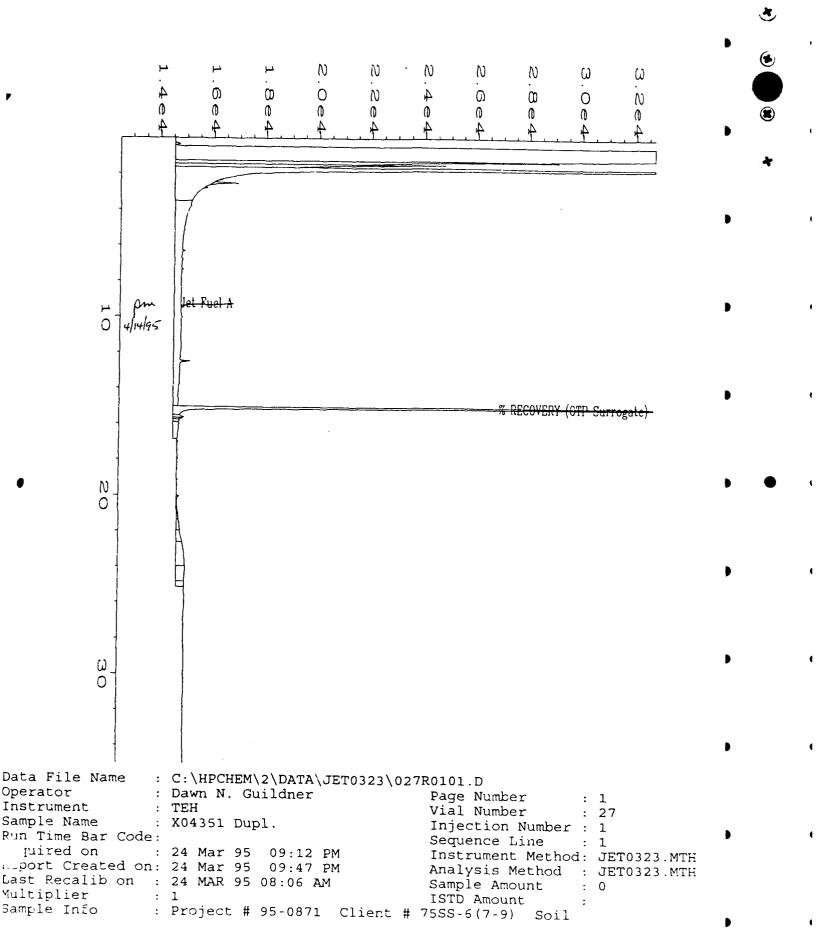


Data File Name : C:\HPCHEM\2\DATA\JET0323\024R0101.D : Dawn N. Guildner Operator Page Number Vial Number : 24 Instrument : TEH Sample Name : X04349 DF≈1 Injection Number: 1 Run Time Bar Code: Sequence Line Acquired on : 24 Mar 95 06:43 PM Report Created on: 24 Mar 95 07:18 PM Instrument Method: JET032. Analysis Method : JET0323.MT Last Recalib on : 24 MAR 95 08:06 AM Sample Amount ISTD Amount Multiplier : 1 : Project # 95-0871 Client # 75SS-15(4-6) Sample Info Soil

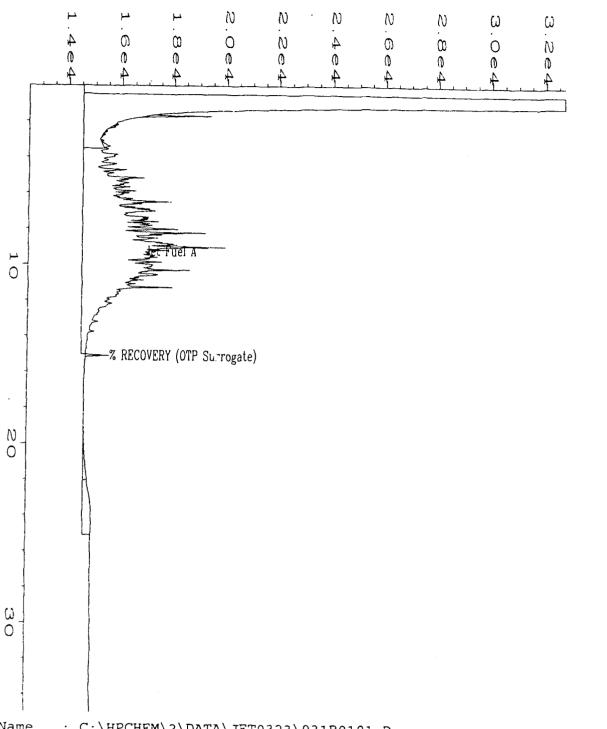




Data File Name : C:\HPCHEM\2\DATA\JET0323\026R0101.D Operator : Dawn N. Guildner Page Number Instrument Vial Number : TEH : X04351 DF=1 Sample Name Injection Number: 1 Run Time Bar Code: Sequence Line Acquired on : 24 Mar 95 08:22 PM Instrument Method: JET032 Report Created on: 24 Mar 95 08:57 PM Analysis Method : JET0323.MT Last Recalib on : 24 MAR 95 08:06 AM Sample Amount Multiplier ISTD Amount Sample Info : Project # 95-0871 Client # 75SS-6(7-9)



•



```
Data File Name
               : C:\HPCHEM\2\DATA\JET0323\031R0101.D
Operator
                : Dawn N. Guildner
                                               Page Number
Instrument
                : TEH
                                               Vial Number
Sample Name
                : X04339 DF=50
                                               Injection Number : 1
Run Time Bar Code:
                                               Sequence Line
                                                               : 1
Acquired on
              : 25 Mar 95 00:30 AM
                                               Instrument Method: JET0323
Report Created on: 25 Mar 95 01:06 AM
                                               Analysis Method : JET0323.MT
Last Recalib cn : 24 MAR 95 08:06 AM
                                               Sample Amount
Multiplier
                : 50
                                               ISTD Amount
Sample Info
               : Project # 95-0871 Client # 75MP-2(2-4) Soil
```

EVERGREEN ANALYTICAL, INC. 4036 Youngfield, Wheat Ridge, CO 80033 (303) 425-6021



TOTAL EXTRACTABLE HYDROCARBONS (TEH) Laboratory Control Sample (LCS)

LCS Number

: LCS032195

Client Project Number

: 722450.21020/MACDILL AFB

Date Prepared
Date Analyzed

: 3/21/95 : 3/24/95 Lab Project Number Matrix : 95-0871 : SOIL

Sequence Number

: JET11

Method Number

: 3500/Mod. 8015

		LCS	
Compound Name	Theoretical Concentration mg/L_	Concentration mg/L	QC Limit mg/L
JET FUEL	1000	1020	600-1400

QUALIFIERS

U = TEH analyzed for but not detected.

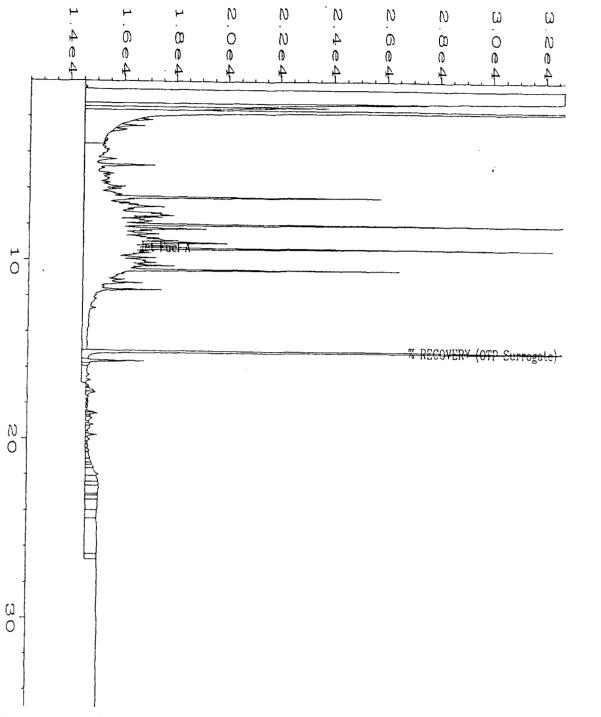
B = TEH found in blank as well as sample (blank data should be compared).

E = Extrapolated value.

NA = Not Available.

Analyst

Approved



Data File Name : Operator :	C:\HPCHEM\2\DATA\JET0323\011	
Inchriment :	Dawn N. Guildner	Page Number : 1
Instrument :	TEH	Vial Number : 11
Sample Name :	LCS032195	Injection Number : 1
Run Time Bar Code:		Sequence Line : 10
Acquired on :	24 Mar 95 07:56 AM	Instrument Method: JET0323 H
Report Created on:	24 Mar 95 09:30 AM	Analysis Method : JET0323.MTF
Last Recalib on :	24 Mar 95 08:06 AM	Sample Amount : 0
Multiplier :	1	ISTD Amount

EVERGREEN ANALYTICAL, INC. 4036 Youngfield St. Wheat Ridge, CO 80033 (303)425-6021

Miscellaneous Analyses

722450.21020

Date Sampled : 3/13-15/95
Date Received : 3/17/95
Date Prepared : 3/20/95
Date Analyzed : 3/20/95 Client Project ID. : MacDill AFB

Lab Project No. : 95-0871 Matrix : Soil

Method : EPA 160.3

Evergreen Sample #	Client <u>Sample ID</u>	Moisture %
X04339	75MP-2 (2-4)	13.8
X04340	75MP-2 (8-10)	17.4
X04341	75SS-3 (3-4)	14.4
X04342	75SS-3 (8-10)	18.0
X04344	75MP-3 (3-5)	15.0
X04347	75MP-5 (4-6)	15.1
X04350	75SS-6 (3-5)	15.1
X04351	75SS-6 (7-9)	19.7

Approved

0871tm.4



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NON-CLP ANALYSIS RESULTS

03/24/95

Lab Name:

Huffman Labs

Client: Evergreen Analytical Contact. Patty McClellan

Contact:

Sue Zeller

Sample Matrix: Huffman Lab #. 143595 soil

Instrument	Method	Sample	Analysis	Prep	Units	Results	Dilution	Element/	Lab	Client	
ID	#	Size (g)	Date	Date			Factor	Compound	ID #	Smp#	
#7	Leco CR12	2.195	03/23/95	NA	%	< 0.05	NA	TC	14359501	755S-4 (3-4)	-
#7	Leco CR12	2.067	03/23/95	NA	%	< 0.05	NA	TC	14359501	755S-4 (3-4)	
#7	Leco CR12	2.154	03/23/95	NA	%	< 0.05	NA	TC	14359502	75SS-6 (3-5)	
#7	Leco CR12	3.332	03/23/95	NA	%	< 0.05	NA	TC	14359503	75MP-7 (4-6)	
#7	Leco CR12	2.888	03/23/95	NA	%	< 0.05	NA	TC	14359504	75MP-17 (4-6)	
#7	Leca CR12	3.555	03/23/95	NA	%	< 0.05	NA	TC	14359505	24MP-7 (2-4)	
#7	Leco CR12	3.331	03/23/95	NA	%	0.21	NA	TC	14359506	24MP-3 (3-5)	
#7	Leco CR12	2.908	03/23/95	NA	%	0.13	NA	TC	14359507	24MP-4 (3-5)	
#7	Leco CR12	3.093	03/23/95	NA	%	2.21	NA	TC	14359508	24MP-6 (4-6)	
#7	Leco CR12	3.394	03/23/95	NA	%	0.73	NA	TC	14359509	24MP-16 (4-6)	
"tower"	COU-02	0.111	03/21/95	NA	%	< 0.02	NA	СС	14359501	755S-4 (3 4)	
"tower"	COU-02	0.259	03/21/95	NA	%	< 0.02	NA	CC	14359501	7555-4 (3-4)	
"tower"	COU-02	0.185	03/21/95	NA	%	< 0.02	NA	CC	14359502	75\$\$-6 (3-5)	
"tow	COU-02	0.248	03/21/95	NA	%	< 0.02	NA	CC	14359503	75MP-7 (4-6)	
"tower	COU-02	0.221	03/21/95	NA	%	< 0.02	NA	CC	14359504	75MP-17 (4-6)	
"tower"	COU-02	0.127	03/21/95	NA	%	< 0.02	NA	CC	14359505	24MP-7 (2-4)	
"tower"	COU-02	0.130	03/21/95	NA	%	< 0.02	NA	CC	14359506	24MP-3 (3-5)	
"tower"	COU-02	0.128	03/21/95	NA	%	< 0.02	NA	CC	14359507	24MP-4 (3-5)	
"tower"	COU-02	0.138	03/21/95	NA	%	< 0.02	NA	CC	14359508	24MP-6 (4-6)	
"tower"	COU-02	0.165	03/21/95	NA	result_	<0.02 çdyukd	NA	ioisture CC	14359509 // m	24MP-16 (4-6)	
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NA	by calc	NA	NA	NA	%	2.21	NA	TOC	14359508	24MP-6 (4-6)	7020
NA	by calc	NA	NA	NA	%	0.73	NA	TOC	14359509	24MP-16 (4-6)	

Samples analyzed and results reported on an as received basis. Soil samples are not homogeneous.

Values reported below Detection Limits are for reference only.

TC detection limit = 0.05% CC detection limit = 0.02%

TOC detection limit = 0.05%

The numbers to the left above represent the last four digits of the EAL project number under which the samples were analyzed.

The original report and quality control results are filed with EAL project 95-08 Page 1



CASE NARRATIVE

Evergreen Analytical Laboratory (EAL) Project #: 95-0861

Parsons Engineering Science, Inc. (PES) Project: MacDill AFB (722450.21020)

Sample Receipt
On March 17, 1995, 12 water samples were received in good condition at Evergreen Analytical Laboratory. The chain of custody requested BTEX, TVH, anions and alkalinity analyses be performed on the trip and field blanks, however, due to lack of sample, only the BTEX and TVH analyses could be performed. Refer to the EAL Sample Log Sheet for specific log-in information and cross-reference of EAL and PES sample identifications.

BTEX, Water Matrix, Method 602 Sample MD24-6A was analyzed at a 10x dilution due to the concentration of benzene in the sample. The reporting limit was increased accordingly. There were no quality control anomalies to report.

Total Volatile Hydrocarbon (TVH)
There were no quality control anomalies to report.

Sulfate, Chloride, Nitrite and Nitrate, Water Matrix, Method E300.0 There were no quality control anomalies to report.

Alkalinity, Water Matrix, Method E310.1
There were no quality control anomalies to report.

Patricia A. McClellan, Project Manager

Date(s) Sampled: 03/15,16/95 COC	Date Due: 03/22/95
Date Received: 03/17/95 1000	
Client Project I.D. 722450.21020/Mac	BTEX,TVH,3/29,30-2 DILL AFB Rush STANDARD-UST 2-OTHERS
Client: Parsons Engineering Science,	Inc. Shipping Charges N/A
Address: 1700 Broadway Suite 900	E.A. Cooler # 383
Denver, CO 80290	Airbill # FEDEX 9581826192
Contact: TODD WIEDEMEIER	Custody Seal Intact? N/A
Client P.O. 722450.21020	Cooler Bottles Y COC Present Y Sample Tags Present? Y
Phone #831-8100 Fax #831-8208	
Special Invoicing/Billing	Sample(s) Sealed? Y
Special Instructions *PLUS CHLOROBENZ	ENE, TMB & TEMB. ANALYZE AN MS/MSD AND
DUPLICATE ON THIS CLIENT'S SAMPLES.	
Lab Client ID # ID# Anal	ysis Mtx Btl Loc
X04288A/B 24MP-10D *BT	EX W 40V 2
X04289 A/B 24MP-10 S *BT	EX W 40V 2
X04290A/B MD24-6A *BT	
X04291A/B MD24-6 *BT	EX W 40V 2
X04292A/B 24MP-9D *BT	EX W 40V 2
X04293A/B 24MP~9 S *BT	EX W 40V 2
X04297A/B 24MP-7D *BT	EX W 40V 2
X04298A/B 24MP-7S *BT	EX W 40V 2
X04299A/B 75MP-1S *BT	EX W 40V 2
X04300A/B 75MP-1D *BT	EX W 40V 2
	EX,TVH W 40V 2
	EX,TVH W 40V 2
X04288C/D 24MP-10D TVI	
X04289C/D 24MP-10S TV	
X04290C/D MD24-6A TVI	
X04291C/D MD24-6 TVF	
X04292C/D 24MP-9D TVI	
R=Sample to be returned	
Route GC/MS GC <u>3</u> Metals	Wet Chem 2 SxPrep Acctg _
SxRec \underline{C} QA/QC \underline{C}	
Page 1 of 2 Page(s)	Custodian/Date: 1803/
	1 1 320

Lab <u>ID</u> #	Client ID#	Analysis	Mtx	Btl Loc
4293C/D	24MP-9S	TVH	W	40V 2
X04297C/D	24MP-7D	TVH	W	40V 2
X04298C/D	24MP-7S	TVH	W	40V 2
X04299C/D	75MP-1S	T∨H	W	40V 2
X04300C/D	75MP-1D	TVH	W	40V 2
X04288E	24MP-10D	ALKALINITY	W	250P B6
X04289E	24MP-10S	ALKALINITY	W	250P B6
X04290E	MD24-6A	ALKALINITY	W	250P B6
X04291E	MD24-6	ALKALINITY	W	250P B6
X04292E	24MP-9D	ALKALINITY	<u> </u>	250P B6
X04293E	24MP-9S	ALKALINITY	W	250P B6
X04297E	24MP-7D	ALKALINITY	W	250P B6
X04298E	24MP-7S	ALKALINITY	W	250P B6
X04299E	75MP-1S	ALKALINITY	W	250P B6
X04300E	75MP-1D	ALKALINITY	W	250P B6
X04288F	24MP-10D	Cl ⁻ ,SO ₄ ,NO ₂ NO ₃	W	250P B6
X04289F	24MP-10S	Cl ⁻ ,SO ₄ ,NO ₂ NO ₃	W	250P B6
#4290F	MD24-6A	C1-,SO ₄ ,NO ₂ NO ₃	W	250P B6
X04291F	MD24-6	Cl ⁻ ,SO ₄ ,NO ₂ NO ₃	W	250P B6
X04292F	24MP-9D	Cl ⁻ ,SO ₄ ,NO ₂ NO ₃	W	250P B6
X04293F	24MP-9S	Cl ⁻ ,SO ₄ ,NO ₂ NO ₃	W	250P B6
X04297F	24MP-7D	C1-,SO ₄ ,NO ₂ NO ₃	W	250P B6
X04298F	24MP-7S	Cl ⁻ , SO ₄ , NO ₂ NO ₃	W	250P B6
X04299F	75MP-1S	Cl ⁻ ,SO ₄ ,NO ₂ NO ₃	W	250P B6
X04300F	75MP-1D	Cl , SO ₄ , NO ₂ NO ₃	W	250P B6

R=Sample to be returned

Page 2 of 2 Pages

Project #<u>95-0861</u>

COSTICATION OF MINER HOME SERVICES REQUEST

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Evergreen Analytical Inc. PARSONS ENGINEERING SCIENCE

FAX # 305 831-82 08

Suite 900

S. BROADWAY

ADDRESS 1700

COMPANY

218 80290

00

STATE

CITY DENVER

PHONE 303 831-8100

FAX RESULTS(Y)

Wheat Ridge, Colorado 80033 (303) 425-6021 FAX (303) 425-6854 (800) 845-7400 4036 Youngfield St.

WIEDEMEIER EAL. QUOTE # 722 450. 210280.# PROJECTIO Mac DILL AFB CLIENT CONTACT (print) TODD

Page / of

TURNAROUND REQUIRED. - 20 - 6 - 6 expedited turnaround subject to additional fee Do not write in shaded area

EAL use only

ANALYSIS REQUESTED

MATRIX

383 LIEFF FETKENHOUR (signature) VG it berline Evergreen Analytical Cooler No._ Sampler Name: Cooler Received (print)

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in shaded area	EAL Propert #	Custodian	EAL Sample No.	33240	8	96	16	26	23	1, 1,6	# 700 # # 700 P	96	70 0	1-8 Location 8-6	Container Size
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Evergreen Analytical Cooler No. 383 Cooler Received	Please PRINT	all information:	CLIENT SAMPLE IDENTIFICATION	24MP-10D	24MP-10S	MD 24-6A	MD24-6	24MP-9D	24MP-95	FIELD BLANK	AND 24 6-08	TRIP BLANK	24MP-70	HT.	DD:

Placed 10 All samples Instructions:

BTEX, TVH, Alkalinh field blank frip blank

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Relinquished by:

Mr Ala.

Date/Time | Repended by Legenature) ASAP, Auished by: (Signature)

DaloTimo

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Evergreen a lytical Inc.

CLIENT CONTACT (print) 100 W, EDEMETER TURNAROUND REQUIRED: 31 TANK P.O.# expedited turnaround subject to additional fee PROJECT ID. Mac Dill AFD EAL QUOTE # 711450. 1/020

7 107 a

FAX # 30 5 COMPANY PARSONS ENGINEERING SCIENCE ANDRESS 1700 S. BROAD AY SUITE 900 SITY DENVER STATE CO ZIP 80190 PHUNE# 303 851 - 8100

Wheat Ridge, Colorado 80033	(303) 425-6021	FAX (303) 425-6854	(800) 845-7400	FAX RESULTS (Y)	
				851-8208	

EAL use only Do not write	in shaded area	EAL Project # 026/	EAL Sample No.	04298	4 99	04 300							-ocation β - ϵ	Container Size
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Samples

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Ever	green Anal	ytical Bar	nple 1	Receipt,	Check-	in Rec	cord	
Date & Time Re	c'a: <u>3-/7</u>	.95 <u> 130</u>)	Shipped	Via:	1.D.		
Client: Par		>			(Airbil	l ≢ if	applicat	ole)
Client Project	ID(s):	224502	<u> 102</u>					
EAL Project #(s): <u>95- 08</u>	61		EAL	Cooler	(s):	Y	N
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Ice packs (Y	3 n	Y N	Y	N	Y N	•	Y N	
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FAX # 303 831-8208 CORPANY PARSONS ENGINEERING SCIENCE S BROADWAY Suite goo SIP 80290 STATE PHONE 30 5 851 - 8100 OUF! SSENCOM CITY DENVELL

~

4036 Youngfield St. (303) 425-6021

Evergreen . alytical Inc.

FAX RESULTS (Y) Wheat Ridge, Colorado 80033 FAX (303) 425-6854 (800) 845-7400

CLIENT CONTACT (print) TODD WIE DE MEIER PROJECTIO Mac DILL AFB

1 of 2

TURNAROUND REQUIRED. - 20 Sanga EAL. QUOTE # 722 450. 2102 0.4 *expedited furnaround subject to additional fee EAL use only Do not write in shaded area

ANALYSIS REQUESTED

Sampler Name:

print Siff FETIGATIONA ragnatural VG et la en licen

MATRIX

Please PRIN

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	DATE	SAMPLED	
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S S S S S S S S S S	Evergreen Analytical Cooler No3_8_3_ Cooler Pecerved	No 383		Gunos		 Metals	7			(2:		(Sircie)	(B:2:::)		948W8	0/ =		_		_		ın shaded area
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ELD RIAD - 10D 3/15/95 1130 6 X <td>CLIENT SAMPLE IDENTIFICATION</td> <td></td> <td></td> <td>Water-Drink</td> <td>(CICIO)</td> <td> TCLP VOA (eincle)</td> <td>//0920 \</td> <td>Lesticides 8</td> <td>SBOHASS</td> <td>_</td> <td>OSQ X378)</td> <td>1.814 H9AT</td> <td></td> <td>CITCIA A LIST</td> <td>Dissolved I</td> <td>'रुष्ट्राम</td> <td>105-10</td> <td></td> <td></td> <td></td> <td>EA</td> <td>L Sample No.</td>	CLIENT SAMPLE IDENTIFICATION			Water-Drink	(CICIO)	 TCLP VOA (eincle)	//0920 \	Lesticides 8	SBOHASS	_	OSQ X378)	1.814 H9AT		CITCIA A LIST	Dissolved I	'रुष्ट्राम	105-10				EA	L Sample No.
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Date/Time 15/91/5

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Date/Time

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CHAIN OF CUSTOUT MECONULARMENTIONE SCHVICES HEQUEST

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CUMPANY PARSONS ENGINEERING SCIENCE	ADDRESS 1700 S BRUADLAY SUITE 900	9	#
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FAX RESULTS **///**

Wheat Ridge, Colorado 80033 Evergreen Analytical Inc. (303) 425-6021 FAX (303) 425-6854 (800) 845-7400 4036 Youngfield St.

WESEMEIER 1/43 TURNAROUND REQUIRED. P.O.# expedited turnaround subject to additional lee 7000 AFD EAL, QUOTE # 712450. 11020 PROJECT I.D. Mac Dill CLIENT CONTACT (print)_

EAL use only Do not write in shaded area

ANALYSIS REQUESTED

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Page 2 of

Sampler Name:

FETE FLYHOUR (signature) Drint) 18 6 6

MATRIX

383 Evergreen Analytical Cooler No. Cooler Received

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(UVPH 8015mod. (Gagest		×	×					$-\frac{1}{2}$				\dashv	Ì
TRPH 418.1/Oil & Gredse 413.1 (circle)		*	一	\neg				\neg			-	\dashv	
(BTEX B020/602 (circle)/A150	^	×	×					_				\dashv	
19913C 00												\neg	
PesvPCBs 8080/608/508 (circle) Herbicides 8150/515 (circle)													
Pesticides 8080/608 (circle)													
BNA 8270/625 (circle)			_										
			_										
TCLP VOA/BNA/PesVHerb/Metals (circle) Colore 8260/2015			_			\Box							
JCLP VOA/PW			=	_		=	_	_	_				
9ôpnIS / IIO			_	_	_				_	_			
(circle) Solid	_	_	-			-	_	}		_	1		10.8
Water-Drinking/Dischargestround	×	×	×	=	-	= =	_			=			Ī
No. of Containers	9	و.	6				_	_	_				7
TIME	0845	044/	1530										placed in ice
ation: DATE SAMPLED	3/16/95	3/16/95	3/10/95										Samples
Evergreen Analytical Cooler No 383 Cooler Received all information: CLIENT SAMPLE DATE IDENTIFICATION SAMPLE	24MP-75	75MP-15	75MP-13								HT	00:	Instructions: All
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3

EVERGREEN ANALYTICAL, INC. 4036 Youngfield St. Wheat Ridge, CO 80033 (303) 425-6021

BTEX Data Report

		Client Project No.	: 722450.21020
Client Sample Number	: 75MP-1S		MacDill
Lab Sample Number	: X04299	Lab Project No.	: 95-0861
Date Sampled	: 3/16/95	Dilution Factor	: 1.00
Date Received	: 3/17/95	Method	: 602
Date Extracted/Prepared	: 3/21/95	Matrix	: Water
Date Analyzed	: 3/22/95	Lab File No.	: BX2032127
		Method Blank No.	: MB032195

		Sample	
Compound Name	Cas Number	Concentration	PQL
		ug/L	ug/L
Benzene ,	71-43-2	U	4.0
Toluene	108-88-3	3.9 J	4.0
Ethyl Benzene	100-41-4	U	4.0
Total Xylene	1330-20-7	U	4.0
Chlorobenzene	108-90-7	U	4.0
1,3,5-trimethylbenzene	108-67-8	U	4.0
1,2,4-trimethylbenzene	95-63-6	U	4.0
1,2,3-trimethylbenzene	526-73-8	U	4.0
1,2,3,4-tetramethylbenzene	488-23-3	U	4.0

Note: Total Xylene consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

Surrogate Recovery:

 α, α, α -Trifluorotoluene : 86% QC Reporting Limits : 70%-130%

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

B = Compound found in blank and sample. Compare blank and sample data.

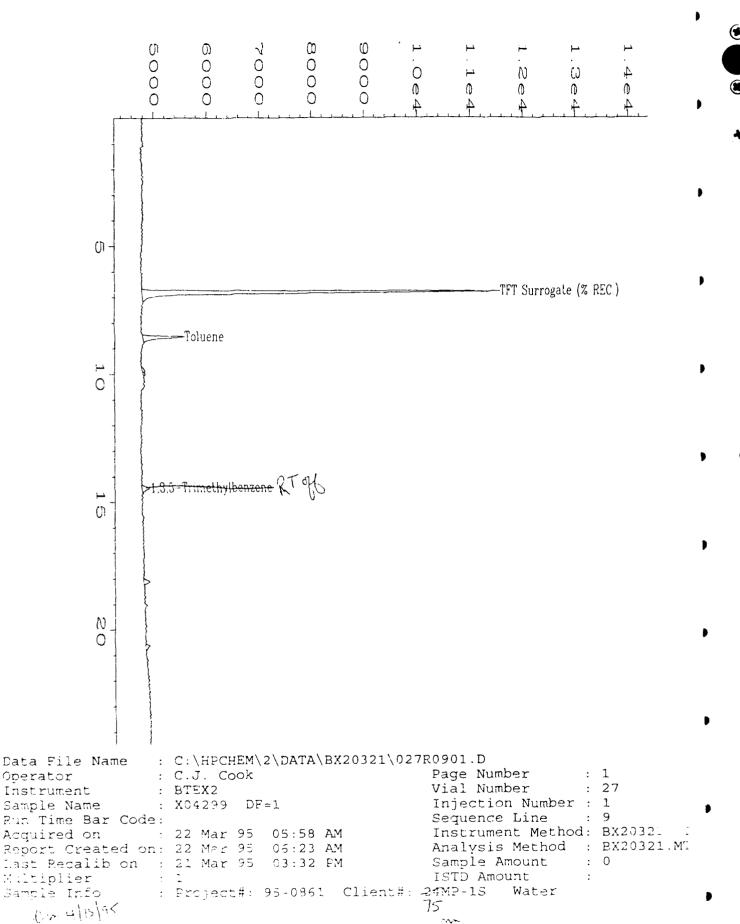
J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available.

Analyst

Approved



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EVERGREEN ANALYTICAL, INC. 4036 Youngfield St. Wheat Ridge, CO 80033 (303) 425-6021

BTEX Data Report

		Client Project No.	: 722450.21020
Client Sample Number	: 75MP-1D		MacDill
Lab Sample Number	: X04300	Lab Project No.	: 95-0861
Date Sampled	: 3/16/95	Dilution Factor	: 1.00
Date Received	: 3/17/95	Method	: 602
Date Extracted/Prepared	: 3/21/95	Matrix	: Water
Date Analyzed	: 3/22/95	Lab File No.	: BX2032128
		Method Blank No.	: MB032195

		Sample	
Compound Name	Cas Number	Concentration	PQL
		ug/L	ug/L
Benzene	71-43-2	1.7 J	4.0
Toluene	108-88-3	0.5 J	4.0
Ethyl Benzene	100-41-4	5.0	4.0
Total Xylene	1330-20-7	U	4.0
Chlorobenzene	108-90-7	U	4.0
1,3,5-trimethylbenzene	108-67-8	U	4.0
1,2,4-trimethylbenzene	95-63-6	U	4.0
1,2,3-trimethylbenzene	526-73-8	U	4.0
1,2,3,4-tetramethylbenzene	488-23-3	11	4.0

Note: Total Xylene consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

Surrogate Recovery:

 α, α, α -Trifluorotoluene

92%

QC Reporting Limits

: 70%-130%

QUALIFIERS:

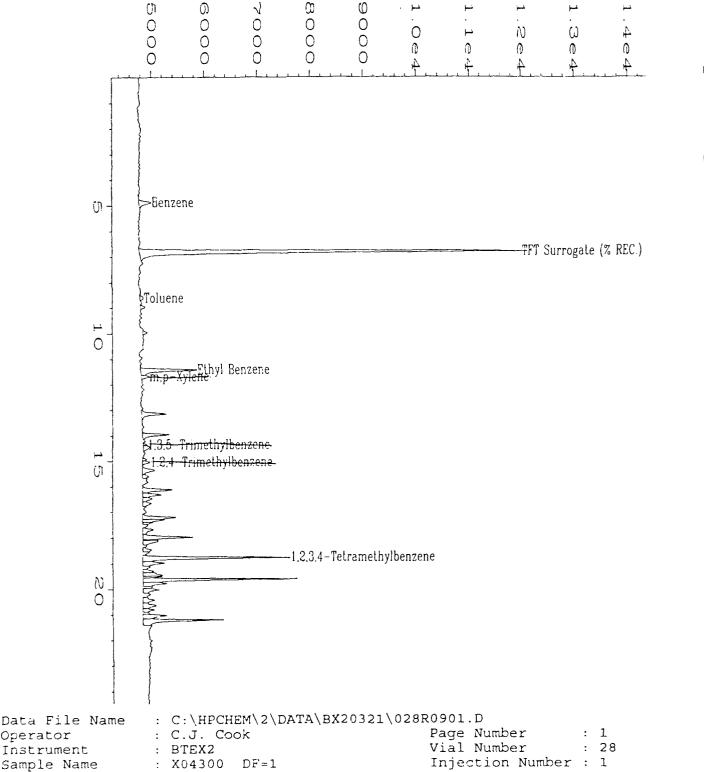
- E = Extrapolated value
- U = Compound analyzed for, but not detected.
- B = Compound found in blank and sample. Compare blank and sample data.
- J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available.

Analyst

Approved



Operator Instrument Sample Name Sequence Line : 9 Run Time Bar Code: Instrument Method: BX20321 : 22 Mar 95 Acquired on 06:43 AM Analysis Method : BX20321.... Report Created on: 22 Mar 95 07:08 AM Sample Amount : 0 Last Recalib on : 21 Mar 95 03:32 PM ISTD Amount Multiplier : Project#: 95-0861 Client#: 24MP-1D Sample Info Water Q m 4/13/9K

Evergreen Analytical, Inc. 4036 Youngfield, Wheat Ridge, CO 80033 (303) 425-6021

TOTAL VOLATILE HYDROCARBONS TVH Matrix Spike/Matrix Spike Duplicate Data Report

Client Sample No.

: 24MP-10D

Client Project No.

: 722450.21020 MACDI

Lab Sample No.

: X04288

Lab Project No. EPA Method No.

: 95-0861 : 5030/8015 Mod

Date Sampled Date Received : 3/15/95 : 3/17/95

Matrix

: Water

Date Prepared

: 3/20/95

Method Blank

: MB032095

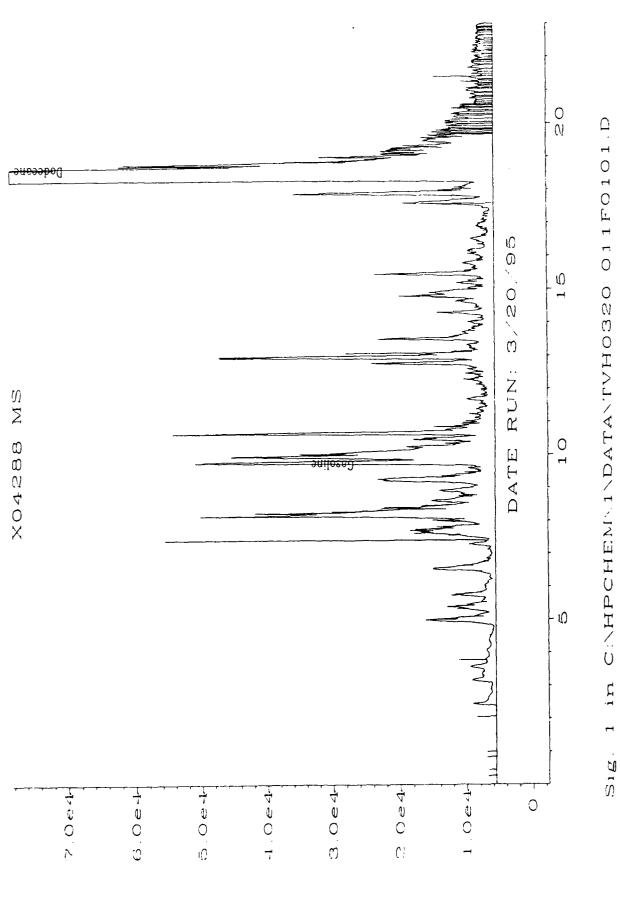
Date Analyzed

: 3/20/95

	Spike	Sample	MS		ac
Compound	Added	Concentration	Concentration	MS	Limits
	(mg/L)	(mg/L)	(mg/L)	%REC	%REC
Gasoline	5.00	0.00	5.18	104	60-140

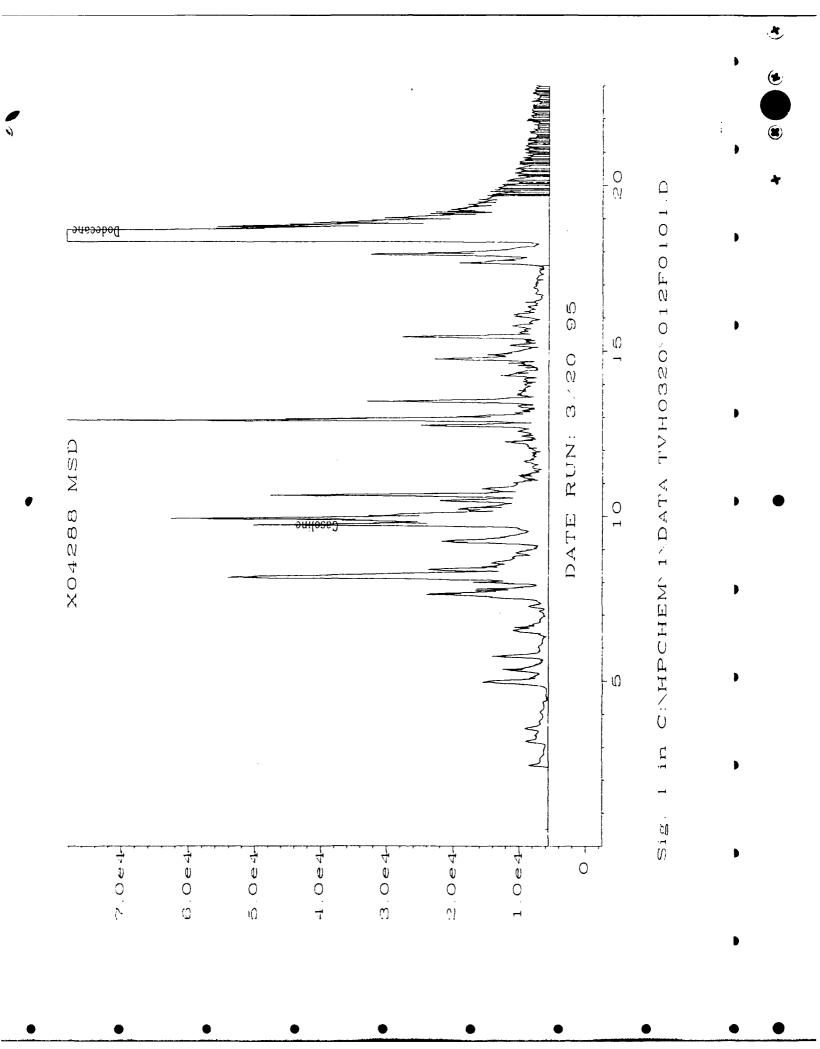
	Spike	MSD	1		C	C
Compound	Added	Concentration	MS	RPD	Lir	nits
	(mg/L)	(mg/L)	%REC		RPD	%REC
Gasoline	5.00	5.64	113	8.5	50	60-140

* = Values outside	of QC limits.
RPD:	out of (1) outside limits.
Spike Recovery:	out of (2) outside limits.
Comments:	NA = Not analyzed/not applicable.

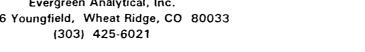


C:\HPCHEM\1\DATA\TVHO320\011F0101.D

<u>*</u>



Evergreen Analytical, Inc. 4036 Youngfield, Wheat Ridge, CO 80033





Client Project No.

: 722450.21020

Client Sample No. : MD24-6

Lab Project No.

MacDill : 95-0861

Lab Sample No. : X04291 **Date Sampled** : 3/15/95 **Date Received** : 3/17/95

EPA Method No. Matrix

: 602 : Water

Date Prepared Date Analyzed : 3/21/95 : 3/21/95

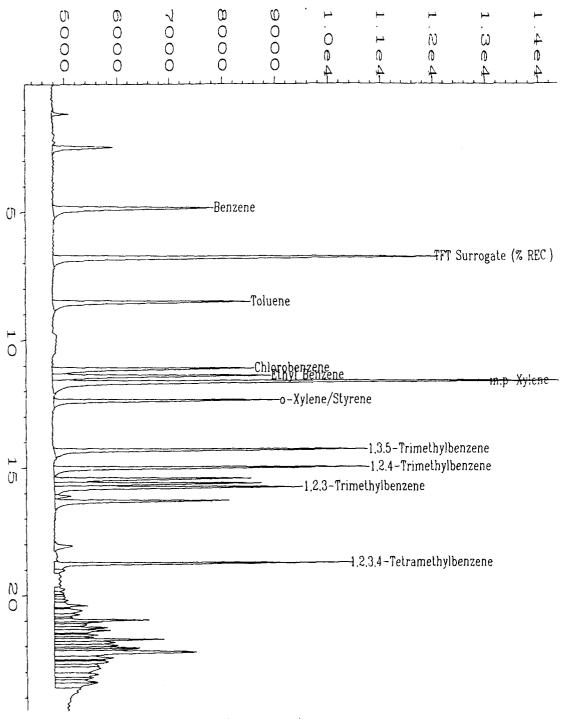
Lab File Number(s) Method Blank

: BX2032119,20 : MB032195

	Spike	Sample	MS		QC
Compound	Added	Concentration	Concentration	MS	Limits
	(ug/L)	(ug/L)	(ug/L)	%REC	%REC
Benzene	20	0.0	17.1	85.5	65-121
Toluene	20	0.0	17.1	85.5	69-117
Ethyl Benzene	20	0.0	17.5	87.5	68-118
m/p-Xylene	40	0.0	35.1	87.8	66-116
o-Xylene	20	0.0	17.1	85.5	73-117
Chlorobenzene	20	0.0	17.1	85.5	65-121
1,3,5-TMB	20	0.0	16.4	82.0	65-12
1,2,4-TMB	20	0.0	16.5	82.5	65-121
1,2,3-TMB	20	0.0	17.0	85.0	65-121
1,2,3,4-TeMB	20	1.0	18.2	86.0	65-121

	Spike	MSD			C	C
Compound	Added	Concentration	MS	RPD	Lir	nits
	(ug/L)	(ug/L)	%REC		RPD	%REC
Benzene	20	16.6	83.0	3.0	17.4	65-121
Toluene	20	17.3	86.5	1.2	15.8	69-117
Ethyl Benzene	20	17.1	85.5	2.3	11.9	68-118
m/p-Xylene	40	34.4	86.0	2.0	15.4	66-116
o-Xylene	20	16.9	84.5	1.2	13.2	73-117
Chlorobenzene	20	16.9	84.5	1.2	17.4	65-121
1,3,5-TMB	20	16.8	84.0	2.4	17.4	65-121
1,2,4-TMB	20	16.7	83.5	1.2	17.4	65-121
1,2,3-TMB	20	16.2	81.0	4.8	17.4	65-121
1,2,3,4-TeMB	20	16.1	75.5	13.0	17.4	65-121

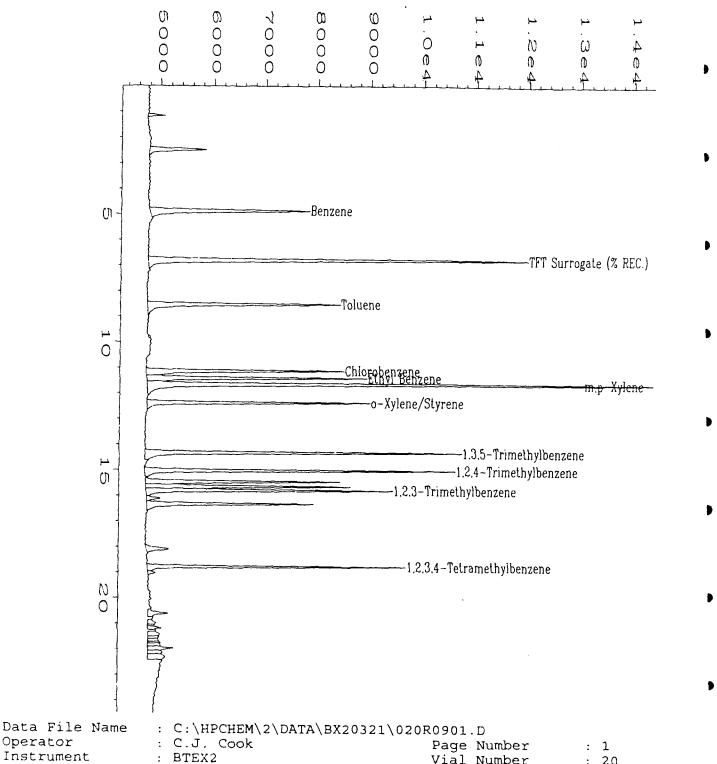
* = Values outside	of QC limits			
RPD:	0	out of	(10)	outside limits.
Spike Recovery:	0	out of	(20)	outside limits.
Comments:	CJG.			



: C:\HPCHEM\2\DATA\BX20321\019R0901.D Data File Name Page Number : C.J. Cook Operator Vial Number : 19 : BTEX2 Instrument Injection Number : 1 X04291MS DF=1Sample Name Sequence Line P • Time Bar Code: Instrument Method: BX20321.MTH uired on : 21 Mar 95 11:44 PM Analysis Method : BX20321.MTH Report Created on: 22 Mar 95 00:09 AM Sample Amount : 0 Last Recalib on : 21 Mar 95 03:32 PM ISTD Amount Multiplier : Project#: 95-0861 Client#: 24MP-6 Water Sample Info

Prom

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Operator Instrument : BTEX2 Vial Number Sample Name : X04291MSD DF=1 Injection Number: 1 Run Time Bar Code: Sequence Line Acquired on : 22 Mar 95 00:31 AM Instrument Method: BX20321.mm Report Created on: 22 Mar 95 00:56 AM Analysis Method : BX20321.MT Last Recalib or : 21 Mar 95 03:32 PM Sample Amount : 0 Multiplier ISTD Amount Sample Info : Project#: 95-0861 Client#: 24MP-6

PROM

BTEX Data Report

		Client Project No.	: 722450.21020
Client Sample Number	: Field Blank		MacDill
Lab Sample Number	: X04294	Lab Project No.	: 95-0861
Date Sampled	: 3/15/95	Dilution Factor	: 1.00
Date Received	: 3/17/95	Method	: 602
Date Extracted/Prepared	: 3/21/95	Matrix	: Water
Date Analyzed	: 3/22/95	Lab File No.	: BX2032129
		Method Blank No.	: MB032195

Compound Name	Cas Number	Sample Concentration ug/L	PQL ug/L
Benzene	71-43-2	υ	4.0
Toluene	108-88-3	U	4.0
Ethyl Benzene	100-41-4	υ	4.0
Total Xylene	1330-20-7	U	4.0
Chlorobenzene	108-90-7	U	4.0
1,3,5-trimethylbenzene	108-67-8	U	4.0
1,2,4-trimethylbenzene	95-63-6	U	4.0
1,2,3-trimethylbenzene	526-73-8	U	4.0
1.2.3.4-tetramethylbenzene	488-23-3	U	4.0

Note: Total Xylene consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

Surrogate Recovery:

 α, α, α -Trifluorotoluene : 81% QC Reporting Limits : 76%-130%

QUALIFIERS:

- E = Extrapolated value
- U = Compound analyzed for, but not detected.
- B = Compound found in blank and sample. Compare blank and sample data.
- J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).
- PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 18, Part II, pa. 8000-14.

NA = Not available.

Analyst

Approved

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                                                          -TFT Surrogate (% REC.)
                 T<del>oluene</del>-
           0
                 1.3.5 Trimethylbenzene
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           N
           0
                  : C:\HPCHEM\2\DATA\BX20321\029R0901.D
Data File Name
                   : C.J. Cook
                                                      Page Number
                                                      Vial Number
                   : BTEX2
Instrument
                                                      Injection Number :
                   : X04294 DF=1
Sample Name
                                                      Sequence Line
Run Time Bar Code:
                                                      Instrument Method: BX20321
Acquired on
                  : 22 Mar 95
                                 07:31 AM
                                                      Analysis Method : BX20321.ml
Report Created on: 22 Mar 95 07:56 AM
                                                      Sample Amount
Last Recalib on : 21 Mar 95 03:32 PM
                                                      ISTD Amount
```

: Project#: 95-0861 Client#: Field Blank

pm 4/13/95

Multiplier

Sample Info

Operator

BTEX Data Report

		Client Project No.	: 722450.21020
Client Sample Number	: Trip Blank		MacDill
Lab Sample Number	: X04296	Lab Project No.	: 95-0861
Date Sampled	: 3/15/95	Dilution Factor	: 1.00
Date Received	: 3/17/95	Method	: 602
Date Extracted/Prepared	: 3/21/95	Matrix	: Water
Date Analyzed	: 3/22/95	Lab File Nc.	: BX2032130
		Method Blank No.	: MB032195

Sample

		Sample	
Compound Name	Cas Number	Concentration	PQL
		ug/L	ug/L
Benzene	71-43-2	U	4.0
Toluene	108-88-3	U	4.0
Ethyl Benzene	100-41-4	U	4.0
Total Xylene	1330-20-7	U	4.0
Chlorobenzene	108-90-7	U	4.0
1,3,5-trimethylbenzene	108-67-8	υ	4.0
1,2,4-trimethylbenzene	95-63-6	U	4.0
1,2,3-trimethylbenzene	526-73-8	υ	4.0
1,2,3,4-tetramethylbenzene	488-23-3	U	4.0

Note: Total Xylene consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

Surrogate Recovery:

α,α,α-Trifluorotoluene QC Reporting Limits

78%

: 70%-130%

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

B = Compound found in blank and sample. Compare blank and sample data.

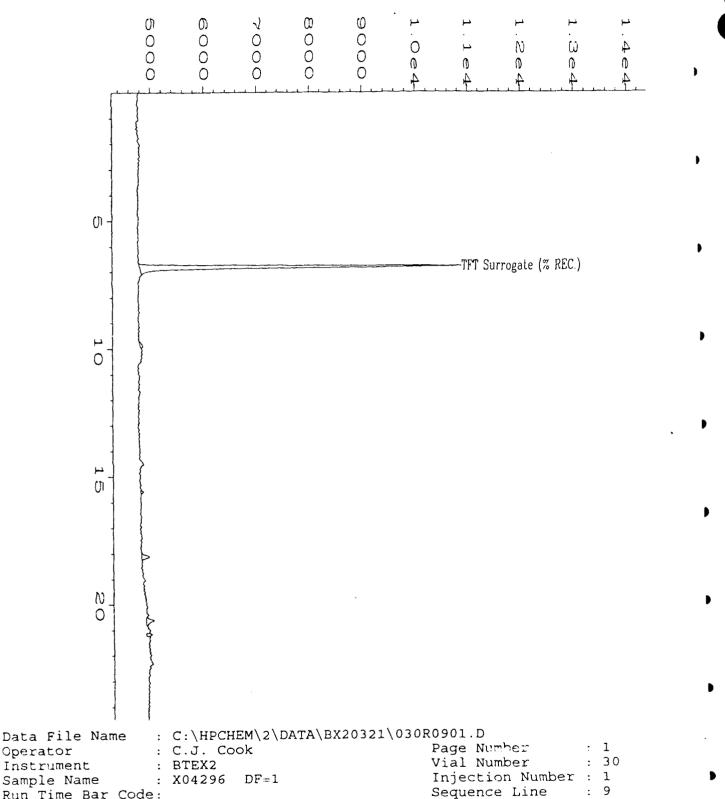
J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available.

Analyst

Approved



BTEX Data Report Method Blank Report

Method Blank Number : MB032195 Client Project No.

: 722450.21020

MacDill

Date Extracted/Prepared **Date Analyzed** : 3/21/95

: 3/21/95

Lab Project No.

: 95-0861

Dilution Factor Method Matrix

: 1.00 : 602

: Water

Lab File No.

: BX2032111

Samp	le
------	----

		Sample	
Compound Name	Cas Number	Concentration	PQL
		ug/L	ug/L
Benzene	71-43-2	U	4.0
Toluene	108-88-3	υ	4.0
Ethyl Benzene	100-41-4	U	4.0
Total Xylene	1330-20-7	υ	4.0
Chlorobenzene	108-90-7	U	4.0
1,3,5-trimethylbenzene	108-67-8	U	4.0
1,2,4-trimethylbenzene	95-63-6	U	4.0
1,2,3-trimethylbenzene	526-73-8	U	4.0
1,2,3,4-tetramethylbenzene	488-23-3	υ	4.0

Note: Total Xylene consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak

Surrogate Recovery:

 α, α, α -Trifluorotoluene

102%

QC Reporting Limits

: 70%-130%

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

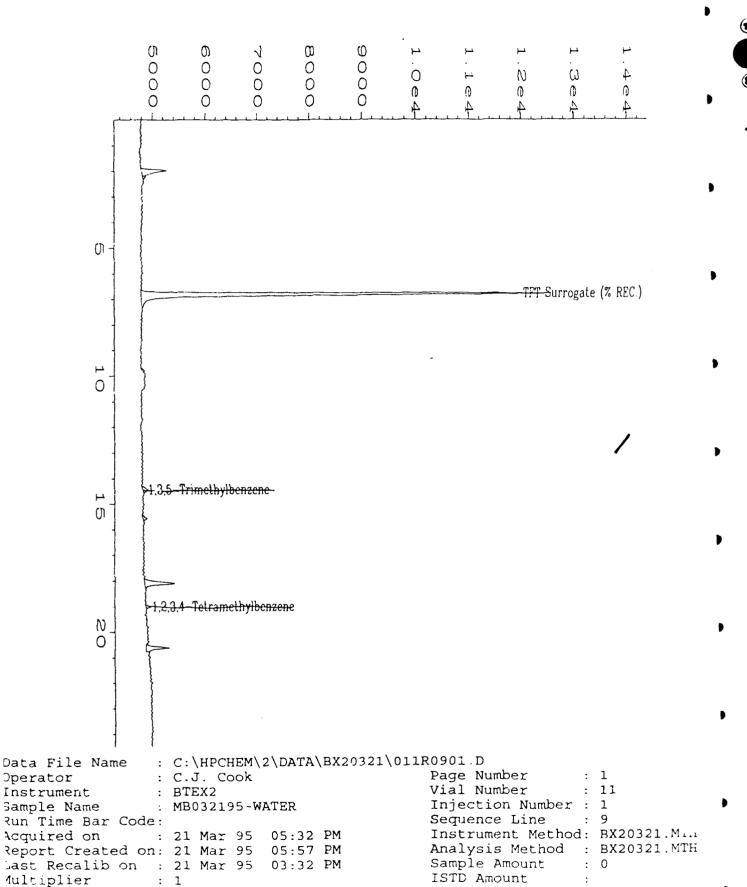
B = Compound found in blank and sample. Compare blank and sample data.

J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available.

Analyst



pm 4/13/95

BTEX Data Report Method Blank Report

Method Blank Number : MB032295 Date Extracted/Prepared : 3/22/95

Client Project No. : 722450.21020

MacDill : 95-0861

Date Analyzed : 3/22/95 Lab Project No. **Dilution Factor** : 1.00 Method : 602 Matrix : Water Lab File No.

U

: BX2032210

PQL

ug/L

4.0

		Sample
Compound Name	Cas Number	Concentration
		ug/L
Panzana	71 /2 2	

Benzene Ū 4.0 Toluene 108-88-3 U 4.0 U 4.0 **Ethyl Benzene** 100-41-4 Total Xylene 1330-20-7 U 4.0 Chlorobenzene 4.0 108-90-7 1,3,5-trimethylbenzene 108-67-8 U 4.0 1,2,4-trimethylbenzene 95-63-6 U 4.0

U 1,2,3,4-tetramethylbenzene 488-23-3 4.0

526-73-8

Note: Total Xylene consist of three isomers, two of which co-elute. The Xylene PQL is for a single peak

Surrogate Recovery:

1,2,3-trimethylbenzene

a,a,a-Trifluorotoluene 81% QC Reporting Limits : 70%-130%

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

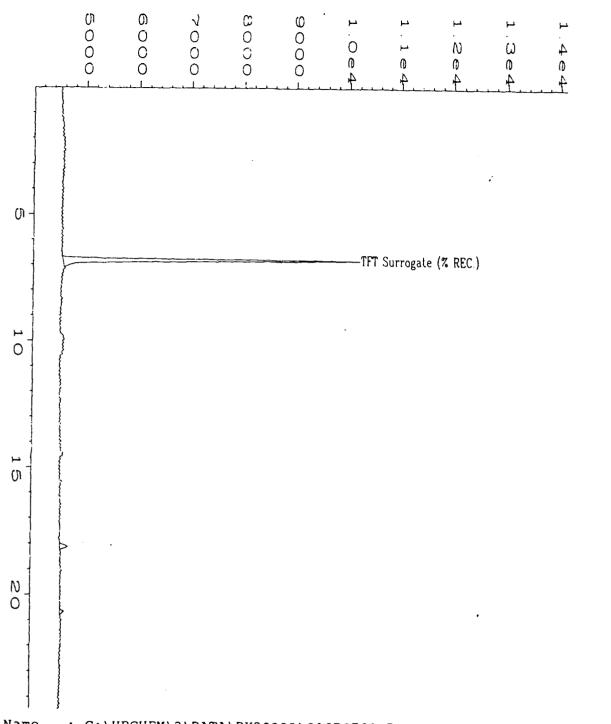
B = Compound found in blank and sample. Compare blank and sample data.

J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available.

Analyst



```
Data File Name
                 : C:\HPCHEM\2\DATA\BX20322\010R0701.D
Operator
                 : C.J. Cook
                                                 Page Number
Instrument
                 : BTEX2
                                                 Vial Number
                                                                  : 10
Sample Name
                 : MB032295-WATER
                                                 Injection Number: 1
Run Time Bar Code:
                                                 Sequence Line
                                                                  : 7
Acquired on
                 : 22 Mar 95
                              05:57 PM
                                                 Instrument Method: BX20322
Report Created on: 22 Mar 95
                              06:22 PM
                                                 Analysis Method : BX20322.mil
Last Recalib on : 22 Mar 95
                              04:04 PM
                                                 Sample Amount
Multiplier
                                                 ISTD Amount
```

BTEX Data Report Laboratory Control Sample (LCS)

LCS Number : LCS032195 Client Project No. : 722450.21020 MacDill

Lab Project No.

: 95-0861

Date Extracted/Prepared : 3/21/95 Date Analyzed : 3/21/95

: 1.00 Dilution Factor Method

: 602

Matrix

: Water

Lab File No.

: BX2032112

Compound Name	Cas Number	LCS Concentration ug/L	QC Limit ug/L
Benzene	71-43-2	37	23-44
Toluene	108-88-3	36	26-43
Ethyl Benzene	100-41-4	36	26-48
m,p-Xylene o-Xylene	NA 95-47-6	37 35	25-47 26-48
Chlorobenzene	108-90-7	36	28-46
1,3,5-trimethylbenzene	108-67-8	37	24-47
1,2,4-trimethylbenzene	95-63-6	30	23-46
1,2,3-trimethylbenzene	526-73-8	35	29-49
1,2,3,4-tetramethylbenzene	488-23-3	34	NA

Note: Total Xylene consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

Surrogate Recovery:

a,a,a-Trifluorotoluene

101%

QC Reporting Limits : 70%-130%

QUALIFIERS:

E = Extrapolated value

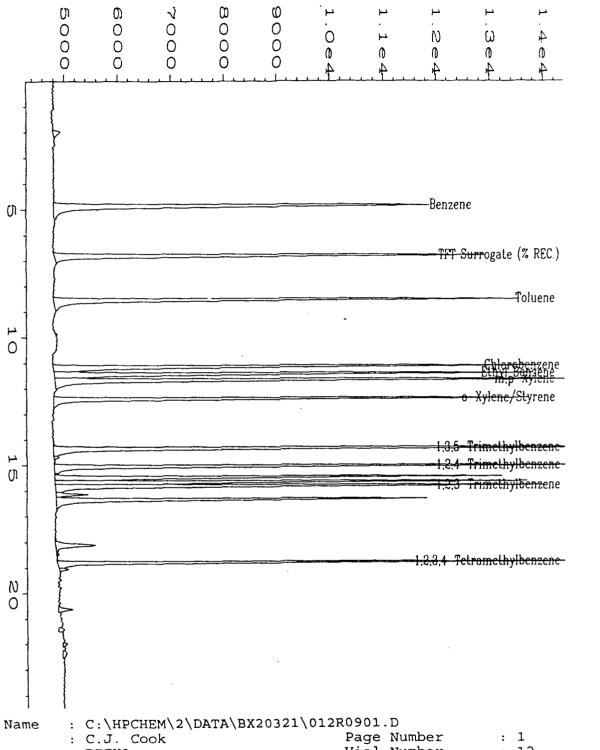
U = Compound analyzed for, but not detected.

B = Compound found in blank and sample. Compare blank and sample data.

J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Desection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not ayallable,



Data File Name Operator Vial Number : 12 Instrument : BTEX2 Injection Number: 1 Sample Name : LCS032195 Sequence Line : 9 Run Time Bar Code: Instrument Method: BX20321. : 21 Mar 95 Acquired on 06:19 PM Analysis Method : BX20321.MTH Report Created on: 21 Mar 95 06:44 PM Last Recalib on : 21 Mar 95 Sample Amount 03:32 PM

: 1

Multiplier

ISTD Amount :

External Standard Penort

External Standard Report

Data File Name : C:\HPCHEM\2\DATA\BX20321\p1qR0901.D

Page Number : 1

istrument : BTEX2 Vial Number : 1

Sample Name : 1.0 ppb BTEX MIX Injection Number : 1

Run Time Bar Code: Sequence Line : 9

Acquired on : 21 Mar 95 04:44 PM Instrument Method: BX20321.MTH Report Created on: 22 Mar 95 08:57 AM Analysis Method : BX20321.MTH

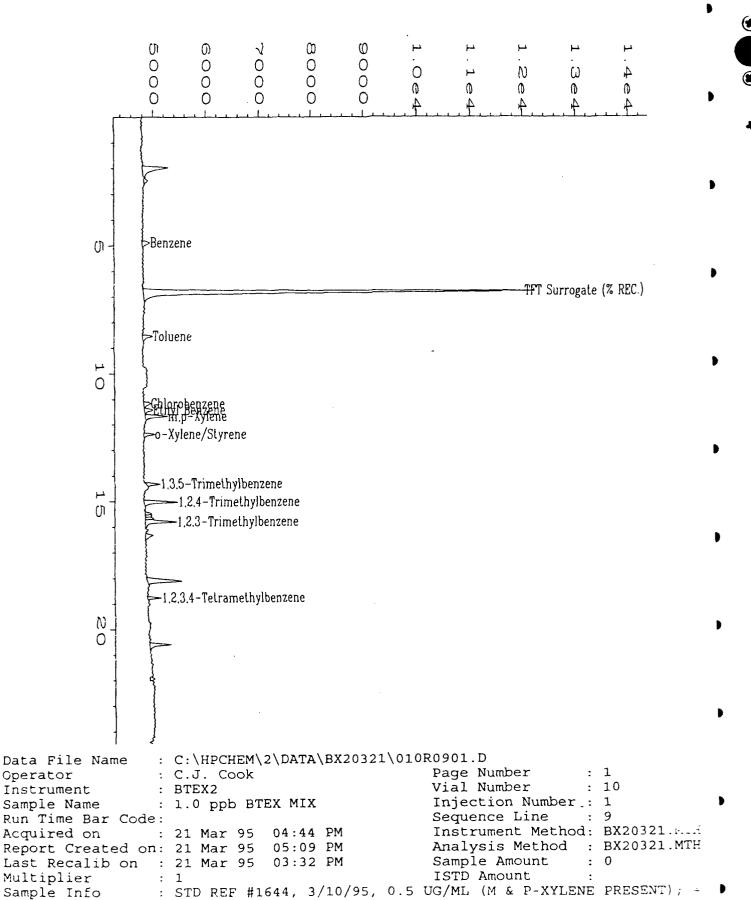
Last Recalib on : 22 Mar 95 08:53 AM Sample Amount : 0 Multiplier : 1 ISTD Amount :

Sig. 2 in C:\HPCHEM\2\DATA\BX20321\010R0901.D

Ret Time	Area	Туре	Width	Ref#	ug/L	Name
2.472	562	VV	0.093	1	0.898	
4.890	1177	PV	0.110	1	2.727	Benzene
6.805	48550	PV	0.100	1-R	94.975	TFT Surrogate (% REC.)
8.553	1297	PV	0.089	1	2.663	Toluene
11.183	1029	BV	0.099	1	2.691	Chlorobenzene
11.440	1070	VV	0.095	1	1.471	Ethyl Benzene
11.675	2403	VV	0.085	1	0.493	m,p-Xylene
12.389	1070	BV	0.076	1	1.698	o-Xylene/Styrene
14.330	1247	PV	0.073	1	0.439	1,3,5-Trimethylbenzene
15.030	3592	PV	0.084	1	1.226	1,2,4-Trimethylbenzene
15.240	* not found	*		1		
15.488	484	BV	0.068	1	1.358	
15.797	3755	VV	0.089	1	0.580	1,2,3-Trimethylbenzene
16.331	1098	VV	0.101	1	13.315	-
48.769	1068	ΡV	0.062	1	1.525	1.2.3.4-Tetramethylbenzene

Time Reference Peak Expected RT Actual RT Difference 3 6.760 6.805 0.045

Not all calibrated peaks were found



1,2,3 & 1,2,4-Trimethylbenzene

External Standard Report Data File Name : C:\HPCHEM\2\DATA\BX20322\@08R0701.D rerator : C.J. Cook istrument : BTEX2 Page Number Vial Number : 8 strument : BTEX2
Sample Name : 1.0 ppb BTEX MIX Injection Number: 1 Run Time Bar Code: -Sequence Line : 7 Acquired on : 22 Mar 95 04:24 PM Instrument Method: BX20322.MTH Report Created on: 23 Mar 95 08:56 AM Analysis Method : BX20322.MTH Last Recalib on : 22 MAR 95 04:04 PM Sample Amount : 0 ISTD Amount Sample Info : STD REF #1644, 3/10/95, 0.5 UG/ML (M & P-XYLENE PRESENT); + 1,2,3 & 1,2,4-Trimethylbenzene Sig. 2 in C:\HPCHEM\2\DATA\BX20322\008R0701.D Ret Time Area Type Width Ref# ug/L Name |-----|----|----|----|----|-----|-----| 2.452 * not found * 1 0.067 1 4.860 438 PV 1.864 Benzene 39381 PV 6.789 0.099 1-R 87.650 TFT Surrogate (% REC.) 0.094 1 0.069 1 8.562 933 PV 1.820 Toluene 1.698 Chlorobenzene 11.144 534 BV 529 PV 0.064 1 1477 BV 0.077 1 11.428 0.289 Ethyl Benzene -2.219 m,p-Xylene 1.133 o-Xylene/Styrene 11.672 1035 BV 0.093 1 12.389 1481 BV 0.103 1 -0.0133 1,3,5-Trimethylbenzene 14.332 2932 BV 0.083 1 1.035 1,2,4-Trimethylbenzene 15.022 15.240 * not found * 1 15.484 1180 PV 0.154 1 4.187

Time Reference Peak Expected RT Actual RT Difference 6.750 0.039 6.789

10.218

0.0762 1,2,3-Trimethylbenzene

0.600 1,2,3,4-Tetramethylbenzene

Not all calibrated peaks were found

2933 VV 0.079 1

0.105

0.059 1

1

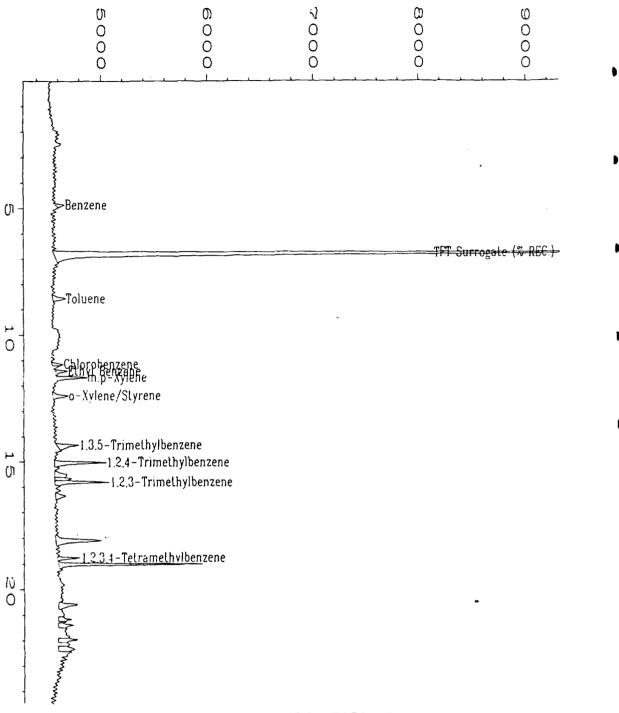
794 VV

948 VV

15.799

16.330

18.764



```
: C:\HPCHEM\2\DATA\BX20322\008R0701.D
Data File Name
                                                 Page Number
                 : C.J. Cook
Operator
                                                 Vial Number
Instrument
                 : BTEX2
                                                 Injection Number: 1
                 : 1.0 ppb BTEX MIX
Sample Name
                                                                  : 7
                                                 Sequence Line
Run Time Bar Code:
                                                 Instrument Method: BX20322
                 : 22 Mar 95
                              04:24 PM
Acquired on
                                                 Analysis Method : BX20322....ri
Report Created on: 22 Mar 95
                              04:50 PM
                                                 Sample Amount
Last Recalib on : 22 Mar 95
                              04:04 PM
                                                 ISTD Amount
Multiplier
                 : 1
                 : STD REF #1644, 3/10/95, 0.5 UG/ML (M & P-XYLENE PRESENT); +
Sample Info
                   1,2,3 & 1,2,4-Trimethylbenzene
```





TOTAL VOLATILE HYDROCARBONS (TVH) Laboratory Control Sample (LCS)

LCS Number

: LCS032095

Client Project Number

: 722450.21020/MACDILL AFB

Date Prepared

: 3/20/95

Lab Project Number

: 95-0861

Date Analyzed

: 3/20/95

Matrix

: WATER

Sequence Number

: TVH9

Method Number

: 5030/8015 MOD

		LCS	
Compound Name	Theoretical Concentration mg/L	Concentration mg/ L	QC Limit mg/L
Gasoline	5.00	5.39	3.5-6.5

QUALIFIERS

U = TEH analyzed for but not detected.

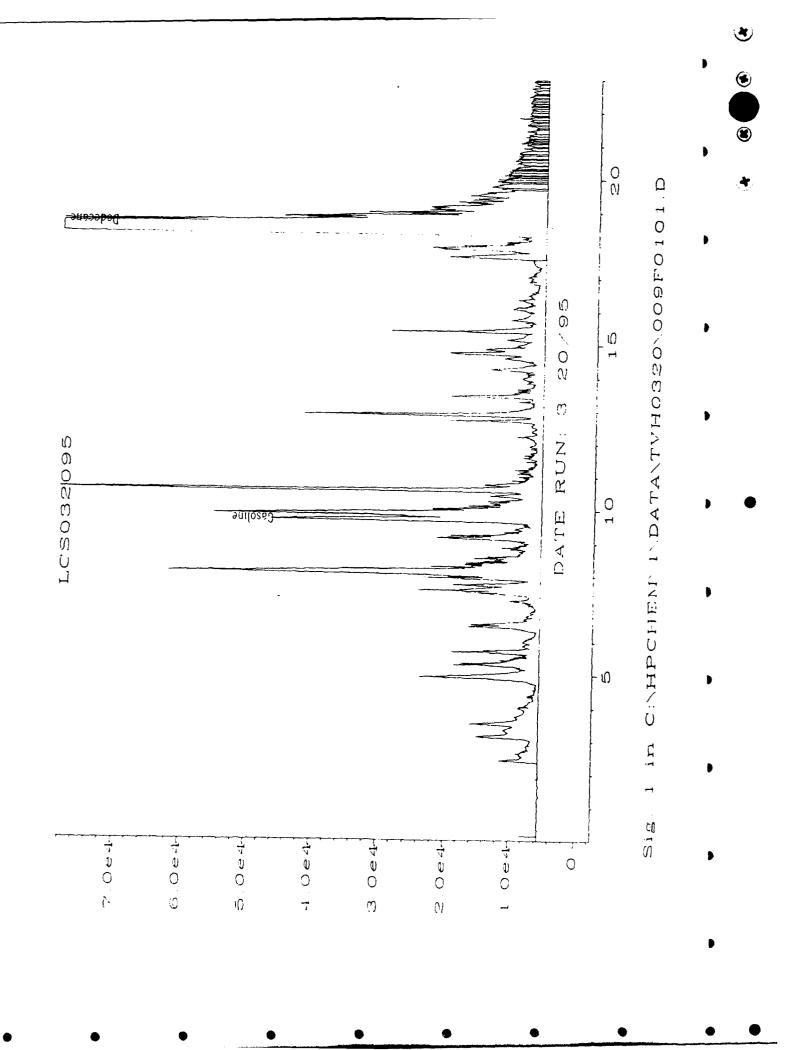
B = TEH found in blank as well as sample (blank data should be compared).

E = Extrapolated value.

NA = Not Available.

Analyst

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Anions

			722450.2102	0
Date Sampled	:	3/15,16/95	Client Project ID. : /Mac Dill A	.FB
D-4- D		2/10/05	Inh Drainat No. Of Oct.	

Date Received: 3/16/95 Lab Project No. : 95-0861
Date Prepared: 3/17/95 Method : EPA 300.0
Date Analyzed: 3/17/95 Matrix : Water

Detection Limit : 0.25 (mg/L)

Evergreen Sample #	Client <u>Sample ID</u>	Sulfate (mg/L)
X04288	24MP-10D	5.78
X04289	24MP-10S	3.64
X04290	MD24-6A	7.34
X04291	MD24-6	6.38
X04292	24MP-9D	12.1
X04293	24MP-9S	1.91
X04297	24MP-7D	79.2
X04298	24MP-7S	76.0
X04299	75MP-1S	35.8
X04300	75MP-1D	15.1
X04300 Dup	75MP-1D Dup	14.7
Method Blan	k 3-17-95	<0.250

Quality Assurance

		Spike Amount (mg/L)	Sample Result (mg/L)	Spike Result <u>(mg/L)</u>	% <u>Recovery</u>
X04300	75MP-1D Matrix Spike	10.0	15.2	25.7	105
X04300	75MP-1D Matrix Spike Dup	10.0	15.2	25.3	102
	MS/MSD RPD				3.09
X04300/	K04300 Dup RPD				2.68

Analyst

Approved

0361tm 25

Anions

			722450.21020	
Date Sampled	:	3/15,16/95	Client Project ID. : /Mac Dill AFE	3
Daka Dagainad	_	2/1//05	Tab Project No . 95 0961	

Date Received: 3/16/95 Lab Project No. : 95-0861
Date Prepared: 3/17/95 Method : EPA 300.0
Date Analyzed: 3/17/95 Matrix : Water

Detection Limit : 0.25 (mg/L)

Evergreer Sample #	n Client <u>Sample ID</u>	Chloride (mg/L)
X04288	24MP-10D	144
X04289	24MP-10S	4.18
X04290	MD24-6A	16.8
X04291	MD24-6	637
X04292	24MP-9D	329
X04293	24MP-9S	12.1
X04297	24MP-7D	1130
X04298	24MP-7S	115
X04299	75MP-1S	13.4
X04300	75MP-1D	9 <i>.</i> 75
X04300 Du	up 75MP-1D Dup	9.62
Method Bl	lank 3-17-95	<0.250

Quality Assurance

		Spike Amount (mg/L)	Sample Result (mg/L)	Spike Result <u>(mg/L)</u>	% <u>Recovery</u>
X04300	75MP-1D Matrix Spike	10.0	9.75	20.1	104
X04300	75MP-1D Matrix Spike Dup	10.0	9.75	20.0	102
	MS/MSD RPD				1.36

X04300/X04300 Dup RPD 1.34

Analyst

Approved

0851tm.25

<u>Anions</u>

			722450.21020	
Date Sampled	:	3/15,16/95	Client Project ID. : /Mac Dill AF	B'
Date Received	:	3/16/95	Lab Project No. : 95-0861	

Date Received: 3/16/95 Lab Project No. : 95-0861
Date Prepared: 3/17/95 Method : EPA 300.0
Date Analyzed: 3/17/95 Matrix : Water

Detection Limit : 0.076 (mg/L)

Evergreen Sample #	Client Sample ID	Nitrite-N (mg/L)
<u>campre</u> n	Dampie ID	ing programme to the state of t
X04288	24MP-10D	<0.076
X04289	24MP-10S	<0.076
X04290	MD24-6A	<0.076
X04291	MD24-6	<0.760*
X04292	24MP-9D	<0.760*
X04293	24MP-9S	<0.076
X04297	24MP-7D	<7.60*
X04298	24MP-7S	<0.760*
X04299	75MP-1S	<0.076
X04300	75MP-1D	<0.076
X04300 Dup	75MP-1D Dup	<0.076
Method Blan	nk 3-17-95	<0.076

Quality Assurance**

		Spike Amount (mg/L)	Sample Result <u>(mg/L)</u>	Spike Result (mg/L)	% <u>Recovery</u>
X04300	75MP-1D Matrix Spike	10.0	<0.250	9.86	98.6
X04300	75MP-1D Matrix Spike Dup	10.0	<0.250	9.05	90.5
	MS/MSD RPD				8.57

X04300/X04300 Dup RPD

NC

- * = Increased detection limit due to matrix interference.
- ** = Quality assurance results reported as Nitrite (NO₂).
- NC = Not Calculated because sample and/or duplication results below detection limit.

Analyst

Approved

0361tm 25

Anions

			722450.21020
-	D=====================================	TD	/14

Date Sampled : 3/15,16/95
Date Received : 3/16/95
Date Prepared : 3/17/95 Client Project ID. : /Mac Dill AFB Lab Project No. : 95-0861 Method : EPA 300.0

Date Analyzed: 3/17/95 : Water Matrix

Detection Limit : 0.056 (mg/L)

Evergreen Sample #	Client Sample ID	Nitrate-N (mq/L)
		1
X04288	24MP-10D	<0.056
X04289	24MP-10S	<0.056
X04290	MD24-6A	<0.056
X04291	MD24-6	2.46
X04292	24MP-9D	<0.056
X04293	24MP-9S	<0.056
X04297	24MP-7D	<0.056
X04298	24MP-7S	<0.056
X04299	75MP-1S	<0.056
X04300	75MP-1D	<0.056
X04300 Dup	75MP-1D Dup	<0.056
Method Blan	k 3-17-95	<0.056

Quality Assurance**

		Spike Amount (mg/L)	Sample Result (mg/L)	Spike Result (mg/L)	% Recovery
X04300	75MP-1D Matrix Spike	10.0	<0.250	9.63	96.3
X04300	75MP-1D Matrix Spike Dup	10.0	<0.250	9.42	94.2
	MS/MSD RPD				2.20

X04300/X04300 Dup RPD

NC

** = Quality assurance results reported as Nitrate (NO₃).

NC = Not Calculated because sample and/or duplication results below detection limit.

Approved

0961tm 25

Miscellaneous Analyses

Date Sampled Date Received Date Prepared Date Analyzed	:	3/17/95 3/18/95	Detection Limit	: :	722450.21020 MacDill AFB 95-0861 5.00 mgCaCO ₃ /L EPA 310.1
--	---	--------------------	-----------------	--------	--

Evergreen Sample #	Client Sample ID	<u>Matrix</u>	Total Alkalinity (mgCaCO ₃ /L)
X04288	24MP-10D	Water	227
X04289	24MP-10S	Water	187
X04290	MD24-6A	Water	309
X04291	MD24-6	Water	173
X04292	24MP-9D	Water	205
X04293	24MP-9S	Water	271
X04297	24MP-7D	Water	200
● X04298	24MP-7S	Water	244
X04299	75MP-1S	Water	74.2
X04299 Duplicate	75MP-1S Duplicate	Water	73.7
X04300	75MP-1D	Water	<5.00
Method Blank 3/18/95			<5.00

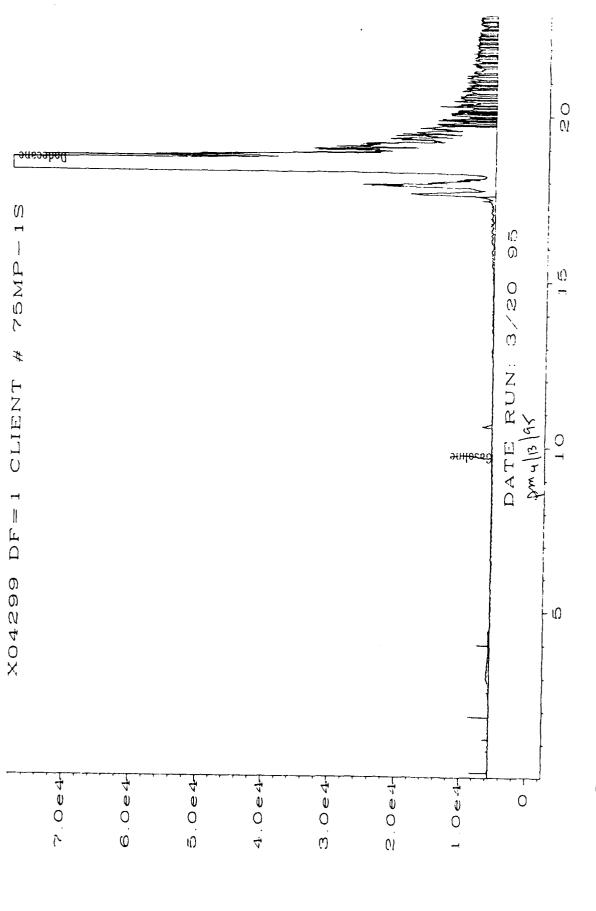
Quality Assurance

	True Value (mgCaCO ₃ /L)	Result (mgCaCO3/L)	% Recovery
APG Reference Minerals Lot #13862	11.8	10.3	87.3
X04299/X04299 Dup RPD			0.680

Analyst

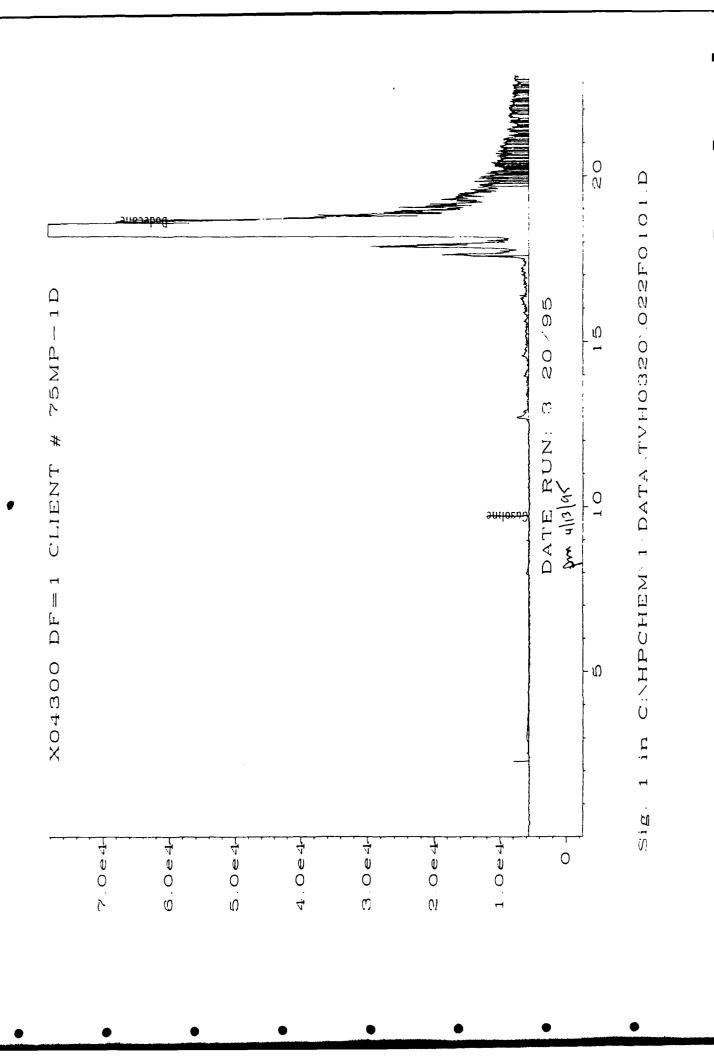
Approved

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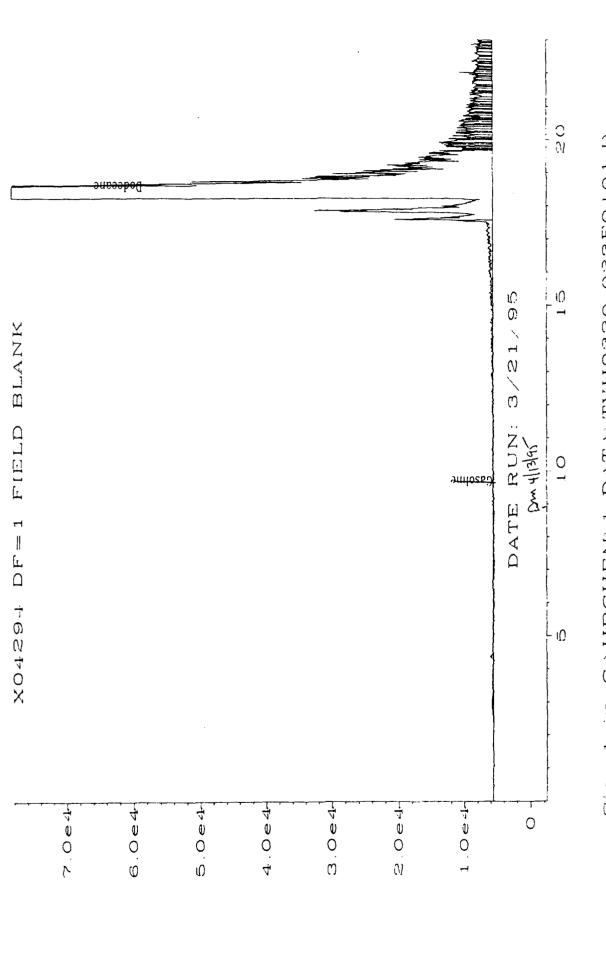
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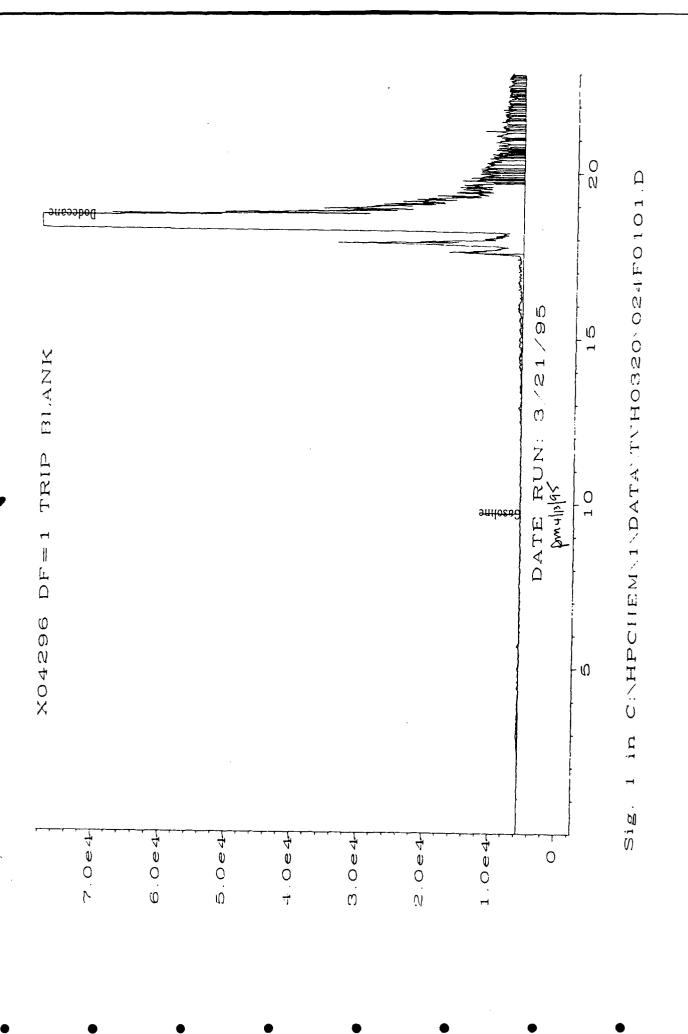


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CAMPCHEMA DATA TVHO320 023F0101.D ın Sign



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TOTAL VOLATILE HYDROCARBONS (TVH) Laboratory Control Sample (LCS)

LCS Number

: LCS032095

Client Project Number

: 722450.21020/MACDILL AFB

Date Prepared
Date Analyzed

: 3/20/95

Lab Project Number

: 95-0861 : WATER

Sequence Number

: 3/20/95 : TVH9 Matrix Method Number

: 5030/8015 MOD

Compound Name	Theoretical Concentration mg/L	LCS Concentration mg/L	QC Limit mg/L
Gasoline	5.00	5.39	3.5-6.5

QUALIFIERS

U = TEH analyzed for but not detected.

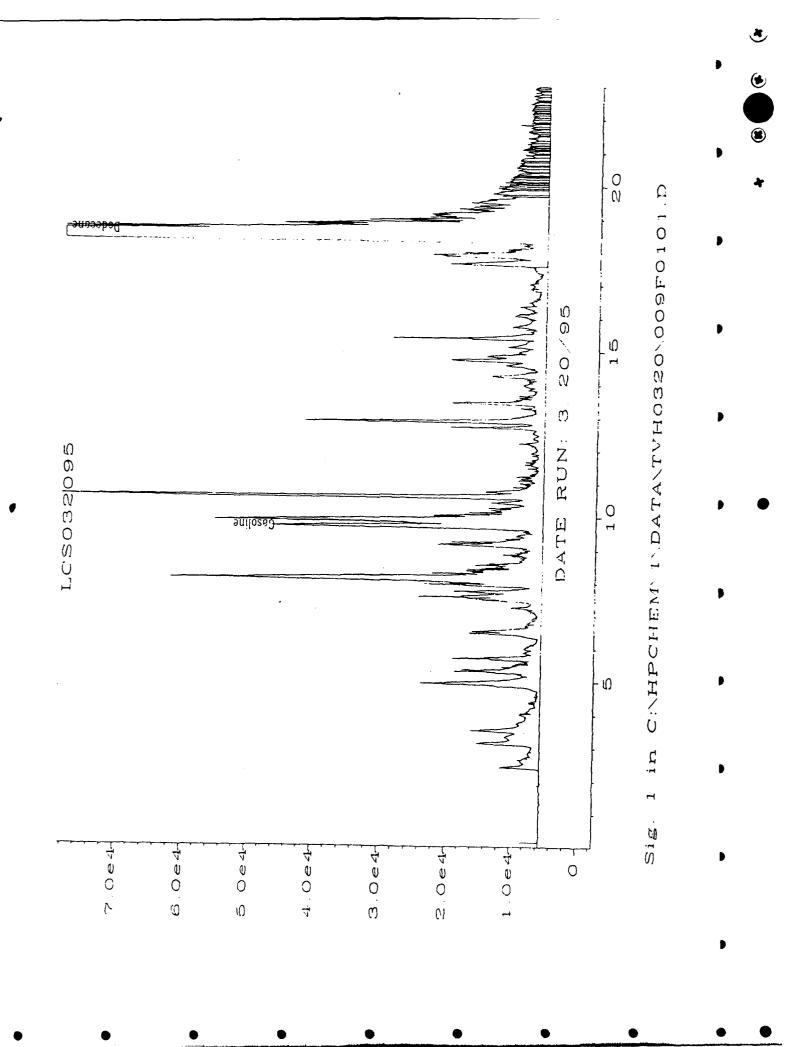
B = TEH found in blank as well as sample (blank data should be compared).

E = Extrapolated value.

NA = Not Available.

Analyst

Approved



Anions

Date Sampled Date Received			Client Project ID. Lab Project No.		
Date Prepared	:	3/17/95	Method		95-0861 EPA 300.0
Date Analyzed	:	3/1//95	Matrix	:	Water

Date Analyzed: 3/17/95 Matrix : Water
Detection Limit : 0.25 (mg/L)

Evergreen Sample #	Client <u>Sample ID</u>	Sulfate (mg/L)
X04288	24MP-10D	5.78
X04289	24MP-10S	3.64
X04290	MD24-6A	7.34
X04291	MD24-6	6.38
X04292	24MP-9D	12.1
X04293	24MP-9S	1.91
X04297	24MP-7D	79.2
X04298	24MP-7S	76.0
X04299	75MP-1S	35.8
X04300	75MP-1D	15.1
X04300 Dup	75MP-1D Dup	14.7
Method Blank	3-17-95	<0.250

Quality Assurance

		Spike Amount (mg/L)	Sample Result (mg/L)	Spike Result (mg/L)	% <u>Recovery</u>
X04300	75MP-1D Matrix Spike	10.0	15.2	25.7	105
X04300	75MP-1D Matrix Spike Dup	10.0	15.2	25.3	102
	MS/MSD RPD				3.09
X04300/X04300 Dup RPD					

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Anions

7	2	2	4	5	0		2	1	0	2	0	ł
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Date Sampled	:	3/15,16/95	Client Pr	roject	ID.	:	/Mac Dill AFB	
			_ ,					

Date Received: 3/16/95 Lab Project No. : 95-0861
Date Prepared: 3/17/95 Method : EPA 300.0
Date Analyzed: 3/17/95 Matrix : Water

Detection Limit : 0.25 (mg/L)

Evergre <u>Sample</u>	_	Chloride (mg/L)
X04288	24MP-10D	144
X04289	24MP-10S	4.18
X04290	MD24-6A	16.8
X04291	MD24-6	637
X04292	24MP-9D	329
X04293	24MP-9S	12.1
X04297	24MP-7D	1130
X04298	24MP-7S	115
X04299	75MP-1S	13.4
X04300	75MP-1D	9.75
X04300	Dup 75MP-1D Dup	9.62
Method	Blank 3-17-95	<0.250

Quality Assurance

		Spike Amount (mg/L)	Sample Result (mg/L)	Spike Result (mg/L)	% Recovery
X04300	75MP-1D Matrix Spike	10.0	9.75	20.1	104
X04300	75MP-1D Matrix Spike Dup	10.0	9.75	20.0	102
	MS/MSD RPD				1.36

X04300/X04300 Dup RPD 1.34

Analyst

Approved

0851tm 25

Anions

22450.21020

Date Sampled : 3/15,16/95 Client Project ID. : /Mac Dill AFB

Date Received: 3/16/95 : 95-0861 Lab Project No. Date Prepared: 3/17/95 : EPA 300.0 Method Date Analyzed: 3/17/95 : Water Matrix

: 0.076 (mg/L)Detection Limit

Evergreen Sample #	Client <u>Sample ID</u>	Nitrite-N (mg/L)
X04288	24MP-10D	<0.076
X04289	24MP-10S	<0.076
X04290	MD24-6A	<0.076
X04291	MD24-6	<0.760*
X04292	24MP-9D	<0.760*
X04293	24MP-9S	<0.076
X04297	24MP-7D	<7.60*
X04298	24MP-7S	<0.760*
X04299	75MP-1S	<0.076
X04300	75MP-1D	<0.076
X04300 Dup	75MP-1D Dup	<0.076
Method Blank	2-17-95	<0.076

Quality Assurance**

		Spike Amount (mg/L)	Sample Result (mg/L)	Spike Result (mg/L)	% Recovery
X04300	75MP-1D Matrix Spike	10.0	<0.250	9.86	98.6
X04300	75MP-1D Matrix Spike Dup	10.0	<0.250	9.05	90.5
	MS/MSD RPD				8.57

X04300/X04300 Dup RPD

NC

* = Increased detection limit due to matrix interference.

** = Quality assurance results reported as Nitrite (NO₂).

NC = Not Calculated because sample and/or duplication results below detection limit.

Approved

0861tm 25

Anions

7	22	24	5	0		2	1	0	2	0	,
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:	3/15,16/95		Client Project ID.	:	/Mac Dill AFB
:	3/16/95		Lab Project No.	:	95-0861
:	3/17/95		Method	:	EPA 300.0
:	3/17/95		Matrix	:	Water
	:	: 3/15,16/95 : 3/16/95 : 3/17/95 : 3/17/95	: 3/16/95 : 3/17/95	: 3/16/95 Lab Project No. : 3/17/95 Method	: 3/16/95 Lab Project No. : 3/17/95 Method :

Detection Limit : 0.056 (mg/L)

Evergreen Sample #	Client <u>Sample ID</u>	Nitrate-N (mg/L)
X04288	24MP-10D	<0.056
X04289	24MP-10S	<0.056
X04290	MD24-6A	<0.056
X04291	MD24-6	2.46
X04292	24MP-9D	<0.056
X04293	24MP-9S	<0.056
X04297	24MP-7D	<0.056
X04298	24MP-7S	<0.056
X04299	75MP-1S	<0.056
X04300	75MP-1D	<0.056
X04300 Dup	75MP-1D Dup	<0.056
Method Blan	k 3-17-95	<0.056

Quality Assurance**

		Spike Amount (mg/L)	Sample Result (mg/L)	Spike Result (mg/L)	% Recovery
X04300	75MP-1D Matrix Spike	10.0	<0.250	9.63	96.3
X04300	75MP-1D Matrix Spike Dup	10.0	<0.250	9.42	94.2
	MS/MSD RPD				2.20

X04300/X04300 Dup RPD

NC

** = Quality assurance results reported as Nitrate (NO $_3$). NC = Not Calculated because sample and/or duplication results below detection limit.

Approved

086117.25

Miscellaneous Analyses

					722450.21020
Date Sampled	:	3/15,16/95	Client Project ID.	:	MacDill AFB
Date Received	:	3/17/95	Lab Project No.	:	95-0861
D 1 D 1 1 1 1		2/12/05	Product and Late of Street		/-

Date Prepared : 3/18/95 Detection Limit : $5.00 \text{ mgCaCO}_3/L$ Date Analyzed : 3/18/95 Method : EPA 310.1

Evergreen Sample #	Client <u>Sample ID</u>	<u>Matrix</u>	Total Alkalinity <u>(mqCaCO₁/L)</u>
X04288	24MP-10D	Water	227
X04289	24MP-10S	Water	187
X04290	MD24-6A	Water	309
X04291	MD24-6	Water	173
X04292	24MP-9D	Water	205
X04293	24MP-9S	Water	271
X04297	24MP-7D	Water	200
X04298	24MP-7S	Water	244
X04299	75MP-1S	Water	74.2
X04299 Duplicate	75MP-1S Duplicate	Water	73.7
X04300	75MP-1D	Water	<5.00

Quality Assurance

	True Value (mgCaCO ₃ /L)	Result (mgCaCO ₃ /L)	% Recovery
APG Reference Minerals Lot #13862	11.8	10.3	87.3
X04399/X04299 Dup RPD			0.680

Analyst

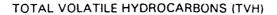
Method Blank 3/18/95

Approved

0861JJ 4

<5.00





Date Sampled

: 3/15,16/95

Client Project Number

: 722450.21020/MACDILL AFB

Date Received

: 3/17/95

Lab Project Number Matrix : 95-0861 : Water

Date Prepared
Date Analyzed

: 3/20/95 : 3/20,21/95

Method Number

: 5030/Mod.8015

Evergreen	Client	Surrogate	TVH	MDL
Sample #	Sample #	Recovery	mg/L	mg/L_
MB032095	METHOD BLANK	100%	U	0.1
X04288	24MP-10D	114%	U	0.1
X04289	24MP-10S	103%	U	0.1
X04290	MD24-6A	116%	0.7	0.1
X04291	MD24-6	121%	U	0.1
X04291 DUP	MD24-6	98%	U	0.1
X04292	24MP-9D	124%	0.3	0.1
X04293	24MP-9S	121%	0.6	0.1
X04294	FIELD BLANK	123%	1.1	0.1
X04296	TRIP BLANK	128%	U	0.1
X04297	24MP-7D	106%	U	0.1
X04298	24MP-7S	113%	U	0.1
X04299	75MP-1S	120%	U	0.1
X04300	75MP-1D	124%	U	0.1

QUALIFIERS

U = TVH analyzed for but not detected.

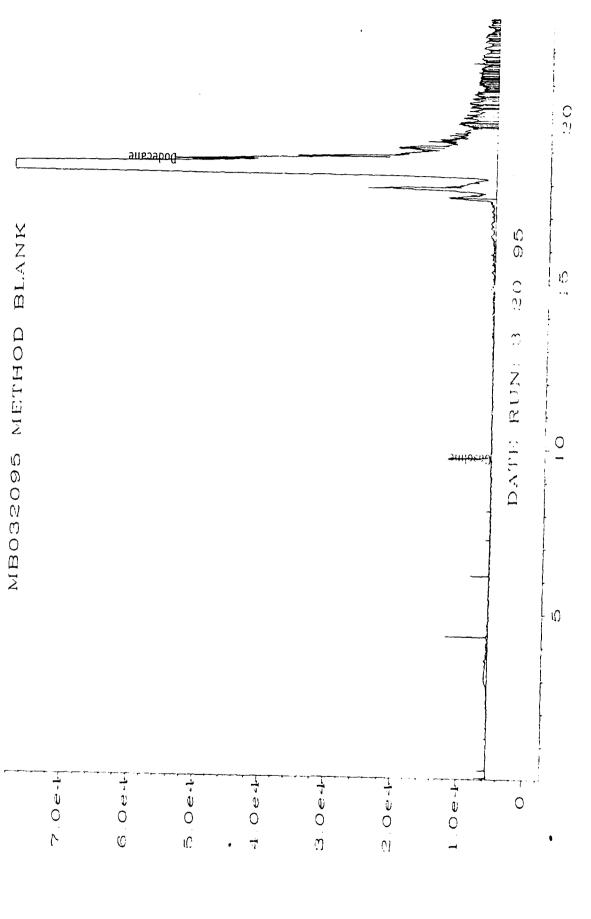
B = TVH found in blank as well as sample (blank data should be compared).

E = Extrapolated value.

MDL = Method Detection Limit

Analyst

La Due J. One



CAMPCHEMAL DATASTATO320.003F0101.D i S.



CASE NARRATIVE

Evergreen Analytical Laboratory Project (EAL) #: 95-0820

Parsons Engineering Science, Inc. (PES) Project: MacDill AFB (722450.21020)

Sample Receipt

On March 14, 1995, 14 soil and one rinseate blank were received in good condition at Evergreen Analytical Laboratory (EAL). Refer to the EAL Sample Log Sheet for specific log-in information and crossreference of EAL and PES sample identifications.

BTEX, Soil Matrix, Method SW8020
The following PES samples were analyzed at a dilution due to target analytes in the sample, the reporting levels were increased accordingly; 24 MP-1A(3'-4'), 24 MP-2(3'-4'), 24 SS-2(4'-6'), 75SS-1(7-9), and 75SS-2(9-11) at a dilution factor of 5. Sample 75SS-1(3-5) was analyzed at DF = 5 and DF = 125, and 75SS-2(3-5) at DF = 250 and DF = 1250.

The matrix spike sample exhibited surrogate recoveries for the triand tetra-methylbenzenes below the EAL control limit, and the matrix spike duplicate sample did not purge. Please see the Laboratory Control Spike (LCS) sample for acceptable spiked sample recovery.

BTEX, Water Matrix, Method 602 The Trip Blank was analyzed with no anomalies to report.

Total Volatile Hydrocarbon (TVH), Soil Matrix, Method 8015M
The relative percent difference (RPD) between the laboratory duplicate samples were not within the control limit of 30% due to There were no other quality control sample inhomogeneity. anomalies to report.

Total Extractable Hydrocarbon (TEH), Soil Matrix, Method 8015M The surrogate recovery for 75SS-2(3-5) was outside the control limits due to the concentration of analyte in the sample. other quality control was within limits.

Evergreen Analytical, Inc. 4036 Youngfield St. Wheat Ridge, CO 30033-3362 (303) 425-6021 FAX (303) 425-6S54

Page Two Case Narrative Parsons Engineering Science 95-0820

Total Organic Carbon in Soil (TOC)
TOC was analyzed by Huffman Laboratories of Golden, Colorado. TOC was determined by analyzing for total carbon (TC) and inorganic (carbonate) carbon (CC), then calculating the difference as TOC. The report from Huffman is included.

Patricia A. McClellan, Project Manager

Evergreen Analytical Sample L	og Sheet	Project # <u>95-0820</u>				
Date(s) Sampled: 03/08,09,10,13/95 COC		Date Due: 03/17/95				
tte Received: 03/14/95 Client Project I.D. 722450.		ng Time(s):	03/22,23, TEPH,TVPH Rush STAN			
Client: PARSONS ENGINEERING	SCIENCE, INC. 8	hipping Cha	rges <u>N/A</u>			
Address: <u>1700 BROADWAY, SUI</u>	re 900 e	.A. Cooler	# <u>604</u>			
DENVER, CO 80290	A	irbill # FE	D EX 95818:	26236		
Contact: TODD WIEDEMEIER		Custody Sea	1 Intact?	N/A		
Client P.O.		Cooler	Bottles _	— у		
		Sample Tags	Present?	¥		
Phone #831-8100 Fax #83		Sample Tags Sample(s) S		Y Y		
Specila Special Instructions_ A DRY WEIGHT BASIS. ANALYZ						
Lab Client [D # ID#	Analysis	Mtx	Btl Loc			
4173A/B 24 MP-1A(3'-4')		S	2WM 2			
3.34174A/B 24 MP-1B(8'-9')	·	S	2WM 2			
(04175A/B 24 MP-2 (3'-4')		S	2WM 2			
(04176A/B 24 MP-3 (3-5)		S	2WM 2			
(04177A/B 24 MP-4 (3-5)		s	2WM 2			
(04178A/B 24 MP-5 (3-5)		S	2WM 2			
(04179A/B 24 MP-6 (4-6)	*_BTEX	S	2WM 2			
(04181A/B 24SS-1 (4-6)	* BTEX	S	2WM 2			
(04182A/B 24SS-2 (4-6)	* BTEX	s	2WM 2			
(04183A/B 75SS-1 (3-5)	* BTEX	s	2WM 2			
(04184A/B 75SS-1 (7-9)	* BTEX / // mc	ishive) s	2WM 2			
(04185 A /B 75SS-2 (3-5)	* BTEX	S	2WM 2			
(04186A/B 75SS-2 (9-11)	* BTEX	S	2WM 2			
(04187A TRIP BLANK	* BTEX	w	40V 2			
R=Sample to be returned	4					
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To SxRec C QA	/QC <u>C</u> Sales	C File	orig	113/14/95		
e 1 of 1 Page(s)		Custodia	in/Date:	ر <i>از اردر</i> ال		
			orig in/Date:	n 3/15/95		

Lab ID #	Client ID#	Analysis	Mtx	Btl	Loc	
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X04174C	24 MP-1B(8'-9')	TVH	S	2WM	2	_
X04175C	24 MP-2 (3'-4')	TVH	s	2WM	2	
X04176C	24 MP-3 (3-5)	TVH	s	2WM	2	
X04177C	24 MP-4 (3-5)	TVH	S_	2WM	2	
X04178C	24 MP-5 (3-5)	TVH	S	2WM	2	
X04179C	24 MP-6 (4-6)	TVH	S	2WM	2	
X04181C	2455-1 (4-6)	TVH	S	2WM	2	
X04182C	24SS-2 (4-6)	TVH	S	2WM	2	
X04183C	7588-1 (3-5)	mare 2 0 (\\ /\\	S	2WM	2	
X04184C	75SS-1 (7-9)	TVH ms ms	S	2WM	2	
X04185C	75SS-2 (3-5)	TVH /	S	2WM	2	
X04186C	75SS-2 (9-11)	TVH	S	2WM	2	
X04173D	24 MP-1A(3'-4')	ТЕН	S	2WM	B2	
X04174D	24 MP-1B(8'-9')	TEH (% MOISTURE)	s	2WM	B2	
X04175D	24 MP-2(3'-4')	TEH MISCIS JPS	S_	2WM	B2	
X04176D	24 MP-3 (3-5)	TEH	S	2WM	B2	
X04177D	24 MP-4 (3-5)	TEH	s	2WM	B2	
X04178D	24 MP-5 (3-5)	TEH	S	2WM	B2	_
X04179D	24 MP-6 (4-6)	TEH Ne	s	2WM	B2	
X04181D	24SS-1 (4-6)	TEH 12 MM	_ s	2WM	B2	
X04182D	24\$\$-2(4-6)	TEH-	S	2WM	B2	
X04183D	75SS-1 (3-5)	TEH _ M2/M2	_s	2WM	B2	
X04184D	75SS-1 (7-9)	TEH/	S	2WM	B2	
X04185D	75SS-2(3-5)	TEH	S	2WM	B2	
X04186D	75SS-2(9-11)	TEH /	S	2WM	B2	
X04173E	24 MP-1A(3'-4')	% MOISTURE	S	2WM	B2	
X04175E	24 MP-2(3'-4')	% MOISTURE ~	s	2WM	B2	
X04176E	24 MP-3 (3-5)	% MOISTURE	S	2WM	B2	
X04177E	24 MP-4 (3-5)	% MOISTURE	S	2WM	B2	
X04178E	24 MP-5 (3-5)	% MOISTURE	s	2WM	B2	
X04179E	24 MP-6 (4-6)	% MOISTURE ~	S	2WM	B2	
X04181E	24SS-1 (4-6)	% MOISTURE	S	2WM	B2	
X04182E	24SS-2(4-6)	% MOISTURE	S	2WM	B2	
X04183E	75SS-1 (3-5)	% MOISTURE /	s	2WM	B2	
X04184E	75SS-1 (7-9)	% MOISTURE	s	2WM	B2	
		Page 2 of 3 Page 2	ages			

Page 2 of 3 Pages Project # 95-0820

R=Sample to be returned

Lab	Client				
ID #	ID#	Analysis	Mtx	Btl	Loc
X0 <u>4185E</u>	75SS-2(3-5)	% MOISTURE	s	2WM	B2
4186E	75SS-2(9-11)	% MOISTURE	S	2WM	B2
X04176D	24 MP-3 (3-5)	TOC ~	S	2WM	our
X04177D	24 MP-4 (3-4)	TOC	S	2WM	OUT
X04179D	24 MP-6 (4-6)	TOC ∽	S	2WM	OUT
X04180A	24 MP-16 (4-6)	TOC(% MOISTURE)	s	2WM	OUT

Page 3 of 3 Pages
Project # 95-0820

R=Sample to be returned

CHAIN OF CUSTODY RECORD / ANALYTICAL SERVICES REQUEST

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CHAIN OF CUSTOUT RECORD / ANALY ITCAL SERVICES REQUEST

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Evergreen Analytical Samp	pl e	Receipt	/Check-in 1	Record	
Date & Time Rec'd: 3/14/95 1000		Shipped	Via: Fed	2X. 95218	<u> ज्योज्य</u> े
client: Parsons ES			(Airbill #	if applica	ble)
Client Project ID(s): 722450.270	00/0) 			
EAL Project #(s):95- (500		EAL	Cooler(s)	: (Y)	N
Cooler# 10Cl					-
Ice packs (Y) N Y N		N	Y N	Y N	5
Temperature °C 110°					
			Y	N	N/A
1. Custody seal(s) present: Seals on cooler intact Seals on bottle intact				7	- Land
2. Chain of Custody present:					•
 Containers broken or leaking: (Comment on COC if Y) 					
4. Containers labeled:					•
5. COC agrees w/ bottles received: (Comment on COC if N)					
<pre>6. COC agrees w/ labels: (Comment on COC if N)</pre>					•
7. Headspace in VOA vials-waters or (comment on COC if Y)	nly				
8. VOA samples preserved:					
9. pH measured on metals, cyanide of List discrepancies*Non-EAL provided containers or	or p	henolic:	s*:samples on:		'
10. Metal samples present:			-	-	/
Total , Dissolved	_		-		
D or PD to be filtered:					
T,TR,D,PD to be Preserved:					
11. Short holding times: Specify parameters					•
12. Multi-phase sample(s) present:					
<pre>13. COC signed w/ date/time:</pre>					
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CHAIN OF CUSTODY RECORD ' NALYTICAL SERVICES REQUEST

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FAX #

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Proble

Sumpler Name

(signature)

(print)

green Analytical Inc.

4036 Youngfield St. Wheat Ridge, Colorado 80033 (303) 425-6021 FAX (303) 425-6854 (800) 845-7400

CLIENT CONTACT (print) U. C. L. L. MENE PROJECT 10 4224 50. 2 7 020

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rage_Lot

EAL. QUOTE #

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FAX RESULTS Y /

TURNAROUND REQUIRED*

expedited turnaround subject to additional fee

EAL use only Do not write in shaded area

ANALYSIS REQUESTED

MATRIX

(point) Ky Let Calana	Evergreen Analytical Cooler No 601	Choler Received
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Please PRIN

		TIME
	DATE	SAMPLED
CLIENT	SAMPLE	IDENTIFICATION

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in sha EAL Project # Custodian											Location	Container Size	
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Evergreen Analytical Cooler No., GCH Choler Received. Please PRINT all information: CLIENT SAMPLE IDENTIFICATION SAMPLEC	24 MP-IA (3 4")	(, b-,8) 81 - JWh:	1401P-3 (5-4)	3 (3-5-)	(3-5-)	24mps (3-1)	14 m. J. (4-6)	24MP-16 (4-C)	T1,-01-6 1-5HC TX-111	STATES - HIS STA			
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or some 24MD-1B (8'-9') Ablack 3/14/55 Instructions Maintaine contained not 971 01 Dacker

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CHAIN OF CUSTODY RECORD / ANALYTICAL SERVICES REQUEST

Page of A.

EDEMEICA 2102 D PO#	EAL use only Do not write	in shaded area EAL Project # Custodian EAL Sample No.							Location	Container Size		
CLIENT CONTACT (pmn) LECIDE MELGA-PROJECT ID 77.2450, 2102.0 EAL QUOTE # PO # TURNAROUND REQUIRED: *expectited furnaround subject to additional fee	REQUESTED	Corcle & list metals below) Dissolved Metals - DW / SW846 Corcle & list metals below) Dissolved Metals - DW / SW846 Corcle & list metals below) Dissolved Metals - DW / SW846 Corcle & list metals below) Dissolved Metals - DW / SW846 Corcle & list metals below) Dissolved Metals - DW / SW846 Corcle & list metals below)	×	34.	×	X						
4036 Youngfield St. Wheat Ridge, Colorado 80033 (303) 425-6021 FAX (303) 425-6854 (800) 845-7400 FAX RESULTS Y / N	ANALYSIS REQ	LEPH 8015md (Gasoline) TVPH 8015mod (Gasoline) TRPH 418 1/Old & Grease 413 1 (circle) BTEX 8020/602 (circle) WTBE (circle) PCB Screen Herbicides 8150/512 (circle) TOTAL SCREEN Herbicides 8150/512 (circle)	×	44. × 64.	× ×	ע צ ע						
///	×ı	Oii / Sludge TCLP VOA/BNA/Pest/Herb/Metals VOA 8260/624/524 2 (circle) BNA 8270/625 (circle) Pesticides 8080/608 (circle)										
2 <u>8</u> 0	MATRIX	Water-Drinking/Discharge/Ground (دنتواف) Solid (ماری) Solid	¥	X	×	×						
ZIP 8029.		∏ M No of Containers	0330 5	10cm 6 2	1215	1245 5						
<u>.</u> 3	411ch	ENT ation: DATE SAMPLED	3-13-95	3-13-15	3-13-6	3-13-85						
Suppler Names	Kie C	Cubier Received Please PRINT All information: CLIENT SAMPLE IDENTIFICATION SAMPLE	7555-1(3-5)	7555-1(7.4)	7555-2 (3-27)	7555-2 (4-11)			117	CD.	instructions.	

BTEX Data Report

		Client Project No.	: 722450.21020
Client Sample Number	: 75SS-1(3-5)		MacDill
Lab Sample Number	: X04183	Lab Project No.	: 95-0820
Date Sampled	: 3/13/95	Dilution Factor	: 5.00
Date Received	: 3/14/95	Method	: 8020
Date Extracted/Prepared	: 3/18/95	Matrix	: Soil
Date Analyzed	: 3/19/95	Lab File No.	: BX2031823
Methanol Extract?	· No	Method Blank No	· MB031895

		Sample	
Compound Name	Cas Number	Concentration*	PQL*
		ug/kg	ug/kg
Benzene	71-43-2	U	24
Toluene	108-88-3	37	24
Ethyl Benzene	100-41-4	550	24
Total Xylene	1330-20-7	••	••
Chlorobenzene	108-90-7	340	24
1,3,5-trimethylbenzene	108-67-8	••	**
1,2,4-trimethylbenzene	95-63-6	••	**
1,2,3-trimethylbenzene	526-73-8	••	••
1,2,3,4-tetramethylbenzene	488-23-3	••	••

Note: Total Xylene consist of three isomers, two of which co-elute.

- * = Sample results & PQLs are reported on a dry weight basis.
- ** = SeeBX2031916 for noted values, df = 125, 03/20/95.

The Xylene PQL is for a single peak.

Surrogate Recovery:

a,a,a.-Trifluorotoluene : 96% QC Reporting Limits : 64%-130%

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

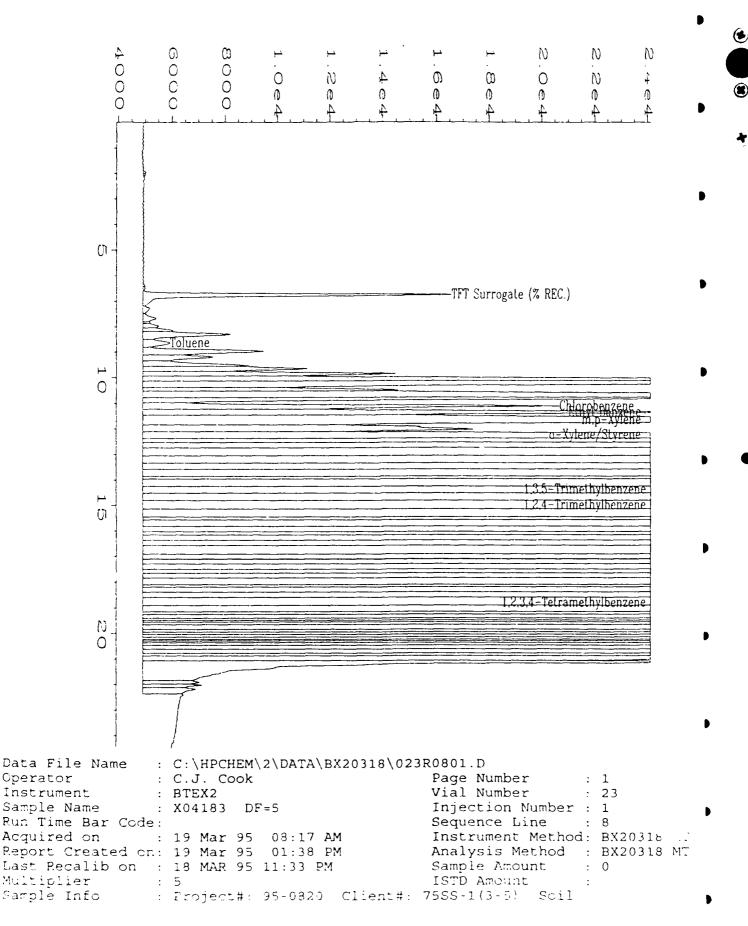
- B = Compound found in blank and sample. Compare blank and sample data.
- J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available

Analyst

Approved



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BTEX Data Report

		Client Project No.	: 722450.21020
Client Sample Number	: 75SS-1(3-5)		MacDill
Lab Sample Number	: X04183	Lab Project No.	: 95-0820
Date Sampled	: 3/13/95	Dilution Factor	: 125.00
Date Received	: 3/14/95	Method	: 8020
Date Extracted/Prepared	: 3/19/95	Matrix	: Soil
Date Analyzed	: 3/20/95	Lab File No.	: BX2031916
Methanol Extract?	: Yes	Method Blank No.	: MEB031995

	Sample			
Compound Name	Cas Number	Concentration*	PQL*	
		ug/kg	ug/kg	
Benzene	71-43-2	••	•	
Toluene	108-88-3	••	• •	
Ethyl Benzene	100-41-4	••	••	
Total Xylene	1330-20-7	4900	600	
Chlorobenzene	108-90-7	••	••	
1,3,5-trimethylbenzene	108-67-8	3200	600	
1,2,4-trimethylbenzene	95-63-6	2200	600	
1,2,3-trimethylbenzene	526-73-8	2300	600	
1,2,3,4-tetramethylbenzene	488-23-3	12000	600	

Note: Total Xylene consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

* = Sample results & PQLs are reported on a dry weight basis.

** = SeeBX2031823 for noted values, df = 5, 03/19/95.

Surrogate Recovery:

a,a,a,-Trifluorotoluene : 105% QC Reporting Limits : 64%-130%

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

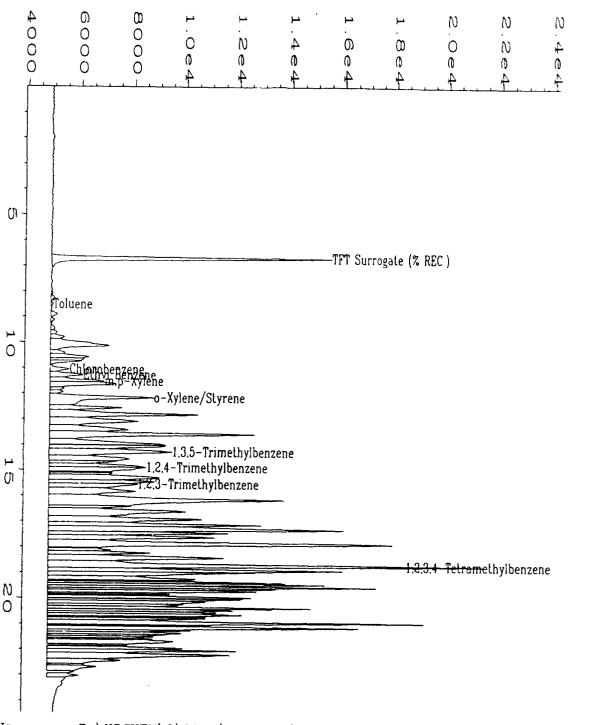
B = Compound found in blank and sample. Compare blank and sample data.

J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 18, Part II, pa. 8000-14.

NA = Not available

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Data File Name
                 : C:\HPCHEM\2\DATA\BX20319\016R1101.D
Operator
                 : C.J. Cook
                                                 Page Number
Instrument
                 : BTEX2
                                                 Vial Number
                                                                  : 16
Sample Name
                 : X04183 DF=125
                                                 Injection Number: 1
Run Time Bar Code:
                                                 Sequence Line
                                                                  : 11
Acquired on
                : 20 Mar 95
                              02:58 AM
                                                 Instrument Method: BX2031
Report Created on: 20 Mar 95
                              03:23 AM
                                                Analysis Method : BX20319.Mr
Last Recalib on : 19 Mar 95 10:59 PM
                                                 Sample Amount
Multiplier
                 : 125
                                                 ISTD Amount
Sample Info
                 : Project#: 95-0820 Client#: 75SS-1(9-5)
                                                              Soil
                                                      -7:-9-
```

12-5) imulias

BTEX Data Report

Client Sample Number	: 75SS-1(7-9)	Client Project No.	: 722450.21020 MacDill
Lab Sample Number	: X04184	Lab Project No.	: 95-0820
Date Sampled	: 3/13/95	Dilution Factor	: 5.00
Date Received	: 3/14/95	Method	: 8020
Date Extracted/Prepared	: 3/18/95	Matrix	: Soil
Date Analyzed	: 3/20/95	Lab File No.	: BX2031915
Methanol Extract?	: No	Method Blank No.	: MEB031995

		Sample	
Compound Name	Cas Number	Concentration* ug/kg	POL* ug/kg
Benzene	71-43-2	U	24
Toluene	108-88-3	υ	24
Ethyl Benzene	100-41-4	υ	24
Total Xylene	1330-20-7	U	24
Chlorobenzene	108-90-7	U	24
1,3,5-trimethylbenzene	108-67-8	υ	24
1,2,4-trimethylbenzene	95-63-6	U	24
1,2,3-trimethylbenzene	526-73-8	U	24
1,2,3,4-tetramethylbenzene	488-23-3	34	24

Note: Total Xylene consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

* = Sample results & PQLs are reported on a dry weight basis.

Surrogate Recovery:

a,a,a,-Trifluorotoluene

99%

QC Reporting Limits

: 64%-130%

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

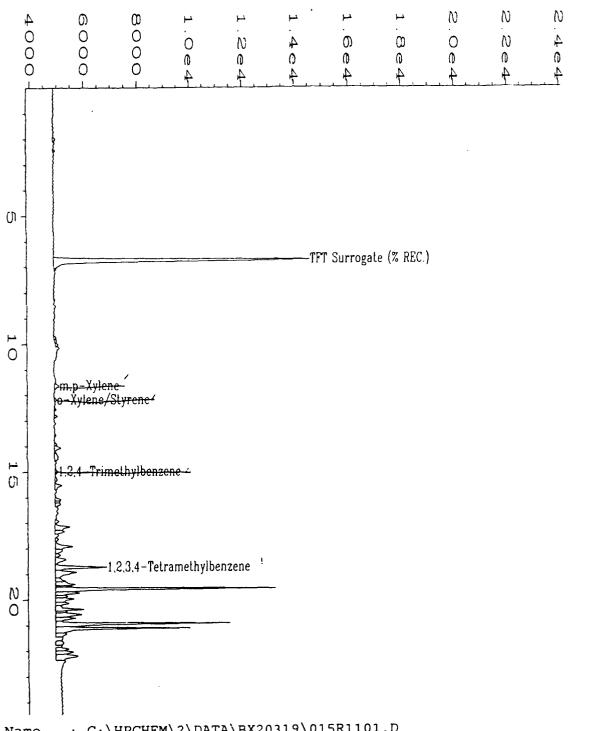
B = Compound found in blank and sample. Compare blank and sample data.

J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available

Approved



: C:\HPCHEM\2\DATA\BX20319\015R1101.D Data File Name Page Number Operator : C.J. Cook : 15 Vial Number : BTEX2 Instrument Injection Number: 1 : X04184 DF=5 Sample Name : 11 Sequence Line Run Time Bar Code: Instrument Method: BX20315 : 20 Mar 95 02:14 AM Acquired on Analysis Method : BX20319.M Report Created on: 20 Mar 95 02:39 AM Sample Amount Last Recalib on : 19 Mar 95 10:59 PM ISTD Amount Multiplier : Project#: 95-0820 Client#: 75SS-1(7-9) Soil Sample Info

Dm 4/11/95

BTEX Data Report

		Client Project No.	: 722450.21020
Client Sample Number	: 75SS-1(7-9)		MacDill
Lab Sample Number	: X04184DUP	Lab Project No.	: 95-0820
Date Sampled	: 3/13/95	Dilution Factor	: 5.00
Date Received	: 3/14/95	Method	: 8020
Date Extracted/Prepared	: 3/19/95	Matrix	: Soil
Date Analyzed	: 3/20/95	Lab File No.	: BX2031919
Methanol Extract?	· No	Method Blank No	· MFR031995

Compound Name	Cas Number	Concentration*	PQL*
		ug/kg	ug/kg
Benzene	71-43-2	U	24
Toluene	108-88-3	U	24
Ethyl Benzene	100-41-4	U	24
Total Xylene	1330-20-7	υ	24
Chlorobenzene	108-90-7	U	24
1,3,5-trimethylbenzene	108-67-8	U	24
1,2,4-trimethylbenzene	95-63-6	υ	24
1,2,3-trimethylbenzene	526-73-8	U	24
1,2,3,4-tetramethylbenzene	488-23-3	54	24

Note: Total Xylene consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

- * = Sample results & PQLs are reported on a dry weight basis.
- ** = Sample run at DF = 5 due to inability to purge at DF = 1.

Surrogate Recovery:

a,a,a,-Trifluorotoluene : 101% QC Reporting Limits : 64%-130%

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

B = Compound found in blank and sample. Compare blank and sample data.

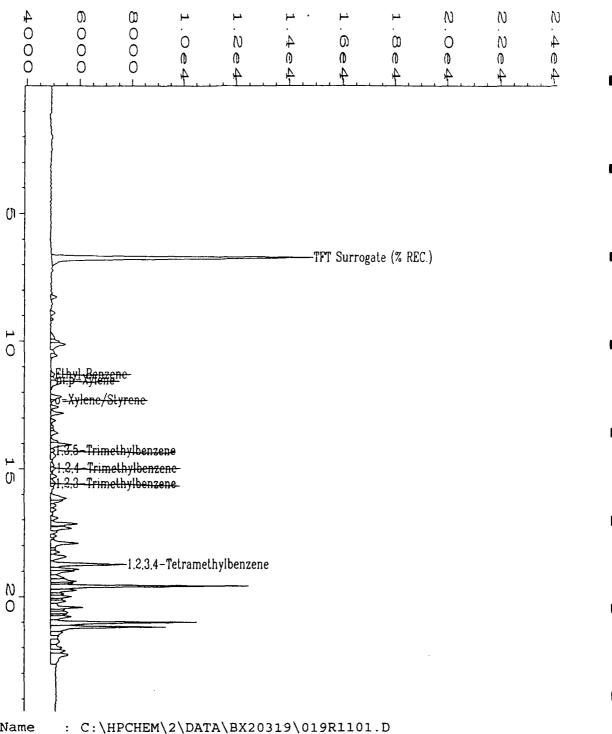
J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available.

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```
Data File Name
Operator
                 : C.J. Cook
                                                 Page Number
                                                                  : 1
Instrument
                 : BTEX2
                                                 Vial Number
                                                                  : 19
Sample Name
                 : X04184DUP
                              DF=5
                                                 Injection Number: 1
Run Time Bar Code:
                                                 Sequence Line
Acquired on
                 : 20 Mar 95
                              05:07 AM
                                                 Instrument Method: BX20319
Report Created on: 20 Mar 95
                              05:32 AM
                                                 Analysis Method : BX20319.MI
Last Recalib on : 19 Mar 95
                                                 Sample Amount
                              10:59 PM
Multiplier
                                                 ISTD Amount
Sample Info
                 : Project#: 95-0820 Client#: 75SS-1(7-9)
                                                              Soil
```

2m4/11/95

BTEX Data Report

Client Sample Number	: 75SS-2(3-5)	Client Project No.	: 722450.21020 MacDill
Lab Sample Number	: X04185	Lab Project No.	: 95-0820
Date Sampled	: 3/13/95	Dilution Factor	: 250.00
Date Received	: 3/14/95	Method	: 8020
Date Extracted/Prepared	: 3/19/95	Matrix	: Soil
Date Analyzed	: 3/20/95	Lab File No.	: BX2031917
Methanol Extract?	: Yes	Method Blank No.	: MEB031995

	Sample			
Compound Name	Cas Number	Concentration*	PQL*	
		ug/kg	ug/kg	
Benzene	71-43-2	330 J	1100	
Toluene	108-88-3	5300	1100	
Ethyl Benzene	100-41-4	14000	1100	
Total Xylene	1330-20-7	67000	1100	
Chlorobenzene	108-90-7	4500	1100	
1,3,5-trimethylbenzene	108-67-8	••	••	
1,2,4-trimethylbenzene	95-63-6	••	**	
1,2,3-trimethylbenzene	526-73-8	••	••	
1,2,3,4-tetramethylbenzene	488-23-3	••	••	

Note: Total Xylene consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

- * = Sample results & PQLs are reported on a dry weight basis.
- ** = SeeBX2032014 for noted values, df = 1250, 03/20/95.

Surrogate Recovery:

a,a,a,-Trifluorotoluene 116% QC Reporting Limits

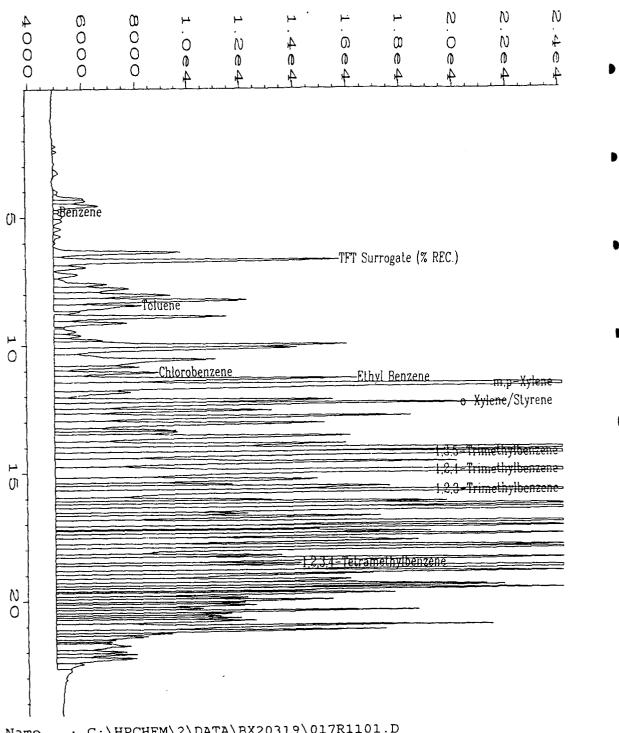
: 64%-130%

QUALIFIERS:

- E = Extrapolated value
- U = Compound analyzed for, but not detected.
- B = Compound found in blank and sample. Compare blank and sample data.
- J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available.



: C:\HPCHEM\2\DATA\BX20319\017R1101.D Data File Name Page Number : C.J. Cook Operator : 17 Vial Number : BTEX2 Instrument Injection Number: 1 : X04185 DF=250 Sample Name Sequence Line Run Time Bar Code: Instrument Method: BX20319. : 20 Mar 95 03:41 AM Acquired on Analysis Method : BX20319.MT Report Created on: 20 Mar 95 04:06 AM Sample Amount Last Recalib on : 19 Mar 95 10:59 PM ISTD Amount : 250 Multiplier : Project#: 95-0820 Client#: 753S-2(3-5) Soil Sample Info

BTEX Data Report

Client Sample Number	: 75SS-2(3-5)	Client Project No.	: 722450.21020 MacDill
Lab Sample Number	: X04185	Lab Project No.	: 95-0820
Date Sampled	: 3/13/95	Dilution Factor	: 1250.00
Date Received	: 3/14/95	Method	: 8020
Date Extracted/Prepared	: 3/20/95	Matrix	: Soil
Date Analyzed	: 3/20/95	Lab File No.	: BX2032014
Methanol Extract?	: Yes	Method Blank No.	: MEB032095

	Sample			
Compound Name	Cas Number	Concentration*	PQL*	
		ug/kg	ug/kg_	
Benzene	71-43-2	• •	• •	
Toluene	108-88-3	**	**	
Ethyl Benzene	100-41-4	••	**	
Total Xylene	1330-20-7	••	**	
Chlorobenzene	108-90-7	••	••	
1,3,5-trimethylbenzene	108-67-8	59000	5600	
1,2,4-trimethylbenzene	95-63-6	73000	5600	
1,2,3-trimethylbenzene	526-73-8	46000	5600	
1,2,3,4-tetramethylbenzene	488-23-3	50000	5600	

Note: Total Xylene consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

- * = Sample results & PQLs are reported on a dry weight basis.
- ** = SeeBX2031917 for noted values, df = 250, 03/20/95.

Surrogate Recovery:

a,a,a,-Trifluorotoluene : 123% QC Reporting Limits : 64%-130%

QUALIFIERS:

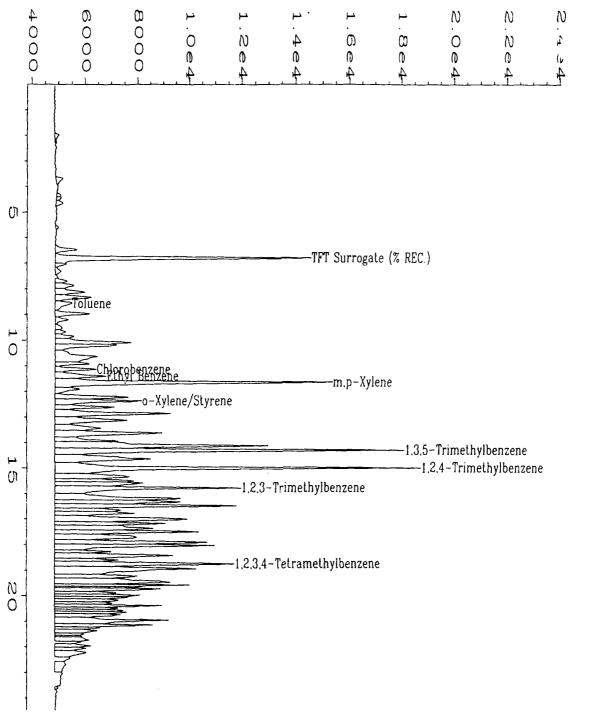
- E = Extrapolated value
- U = Compound analyzed for, but not detected.
- B = Compound found in blank and sample. Compare blank and sample data.
- J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available

Analyst

Approved



Data File Name : C:\HPCHEM\2\DATA\BX20320\014R1001.D Operator C.J. Cook Page Number Vial Number Instrument BTEX2 : 14 Sample Name : X04185 DF=1250 Injection Number: 1 : 10 Run Time Bar Code: Sequence Line Acquired on : 20 Mar 95 10:41 PM Instrument Method: BX20320 Report Created on: 20 Mar 95 11:06 PM Analysis Method : BX20320.MT Last Recalib on : 20 Mar 95 06:26 PM Sample Amount Multiplier : 1250 ISTD Amount Sample Info : Project#: 95-0820 Client#: 75SS-2(3-5) Soil/Ext

BTEX Data Report

Client Sample Number	: 75\$\$-2(9-11)	Client Project No.	: 722450.21020 MacDill
Lab Sample Number	: X04186	Lab Project No.	: 95-0820
Date Sampled	: 3/13/95	Dilution Factor	: 5.00
Date Received	: 3/14/95	Method	: 8020
Date Extracted/Prepared	: 3/18/95	Matrix	: Soil
Date Analyzed	: 3/19/95	Lab File No.	: BX2031826
Methanol Extract?	: No	Method Blank No.	: MB031895

	Sample			
Compound Name	Cas Number	Concentration*	PQL*	
		ug/kg	ug/kg	
Benzene	71-43-2	32	24	
Toluene	108-88-3	υ	24	
Ethyl Benzene	100-41-4	39	24	
Total Xylene	1330-20-7	25 J	24	
Chlorobenzene	108-90-7	U	24	
1,3,5-trimethylbenzene	108-67-8	22 J	24	
1,2,4-trimethylbenzene	95-63-6	21 J	24	
1,2,3-trimethylbenzene	526-73-8	9.8 J	24	
1,2,3,4-tetramethylbenzene	488-23-3	34	24	

Note: Total Xylene consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

* = Sample results & PQLs are reported on a dry weight basis.

Surrogate Recovery:

a.a.a,-Trifluorotoluene : 89%

QC Reporting Limits : 64%-130%

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

B = Compound found in blank and sample. Compare blank and sample data.

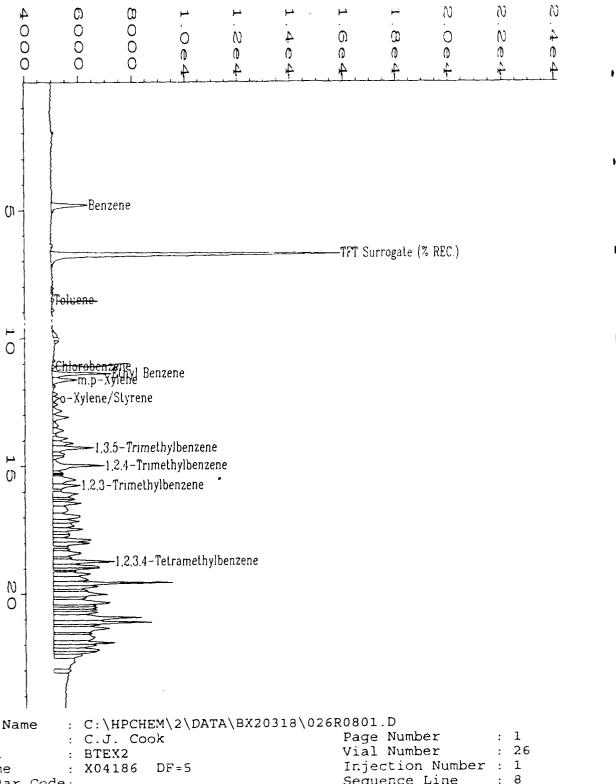
J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available

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Data File Name Operator Instrument Sample Name Sequence Line Run Time Bar Code: Instrument Method: BX20318 : 19 Mar 95 10:31 AM Acquired on : BX20318.... Report Created on: 19 Mar 95 01:39 PM Analysis Method Last Recalib on : 18 MAR 95 11:33 PM Sample Amount ISTD Amount Multiplier : 5 : Project#: 95-0820 Client#: 75SS-2(9-11) Soil Sample, Info

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Client Sample No.

: 24 MP-1A(3'-4')

Client Project No.

: 722450.21020/MAC DI

Lab Sample No.

: X04173

Lab Project No. EPA Method No. : 95-0820

: 5030/8015 Mod

Date Sampled

: 3/8/95

Matrix

: Water

Date Received
Date Prepared

: 3/14/95

Method Blank

: MB031695

Date Analyzed

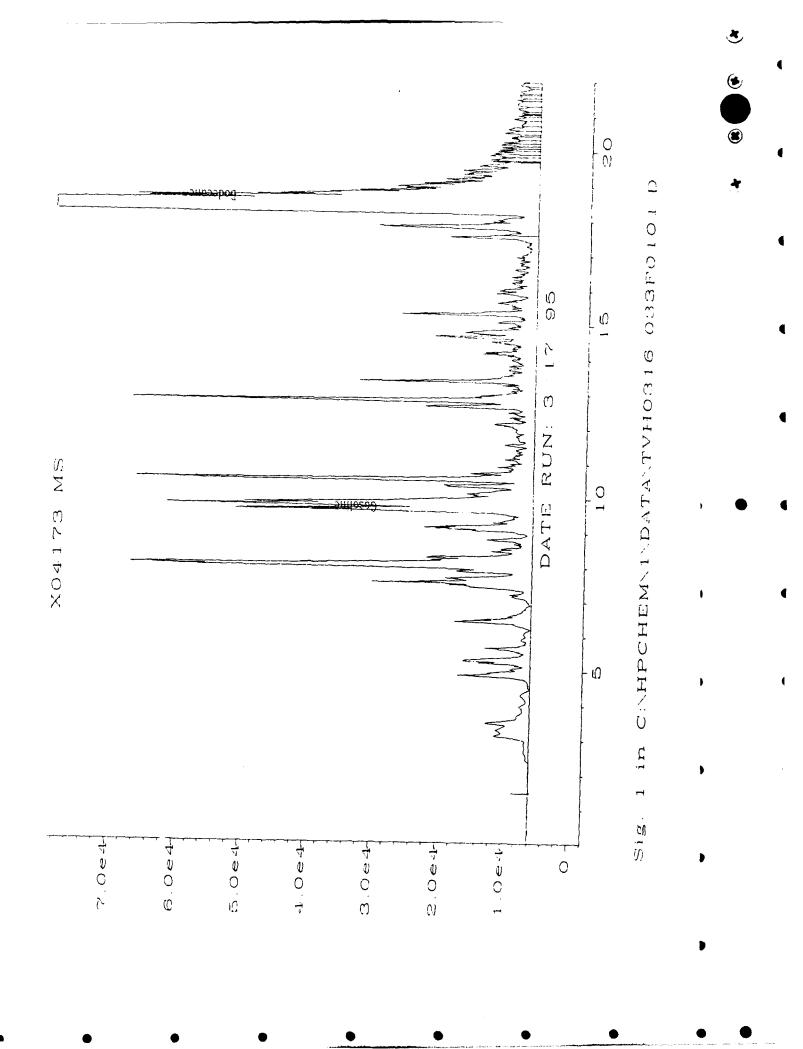
: 3/16/95,3/17/95: 3/16/95,3/17/95

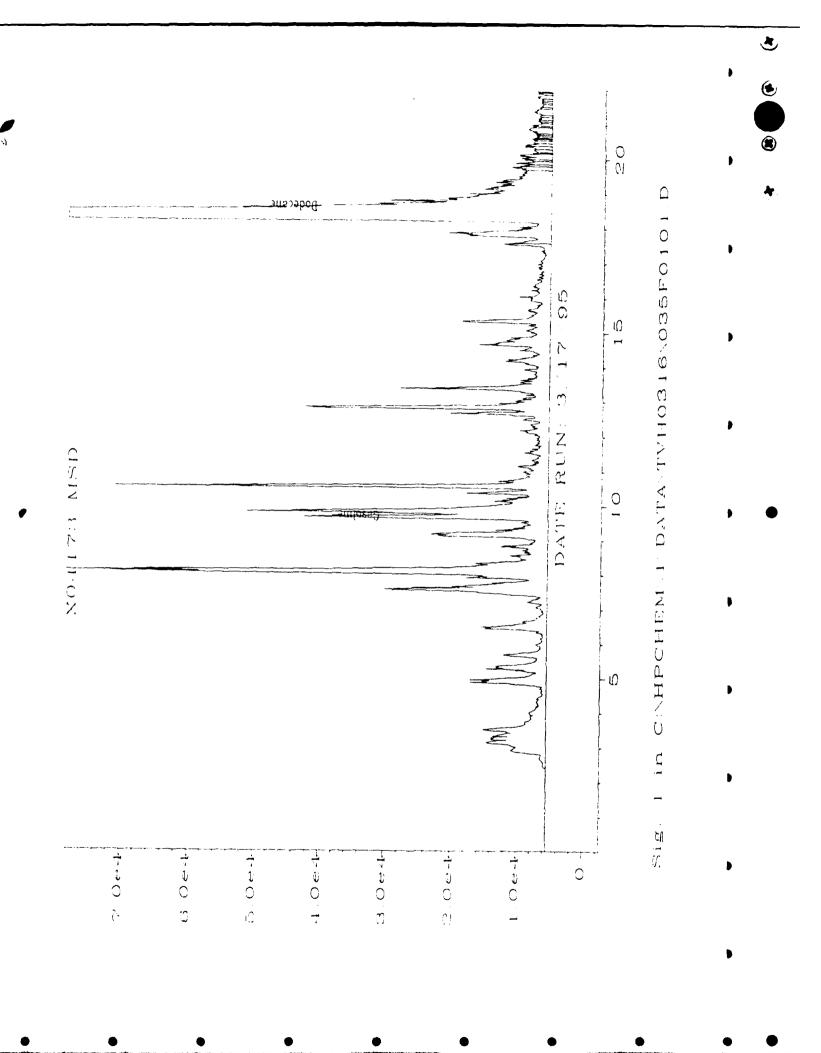
Date Analyzed : 3/10/95,3/17/95

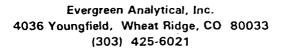
	Spike	Sample	MS		σc
Compound	Added	Concentration	Concentration	MS	Limits
	(mg/L)	(mg/L)	(mg/L)	%REC	%REC
Gasoline	5.00	0.00	6.51	130	60-140

	Spike	MSD			QC	
Compound	Added	Concentration	MSD	RPD	Lir	nits
	(mg/L)	(mg/L)	%REC		RPD	%REC
Gasoline	5.00	6.01	120	8.0	50	60-140

* = Values outside	of QC limits.
RPD:	O out of (1) outside limits.
Spike Recovery:	O out of (2) outside limits.
Comments:	NA = Not analyzed/not applicable.









Lab Sample No. : X04163 Lab Project No. : 95-0819

 Date Sampled
 : 3/10/95
 EPA Method No.
 : 3500/MOD.8015

 Date Received
 : 3/14/95
 Matrix
 : SOIL

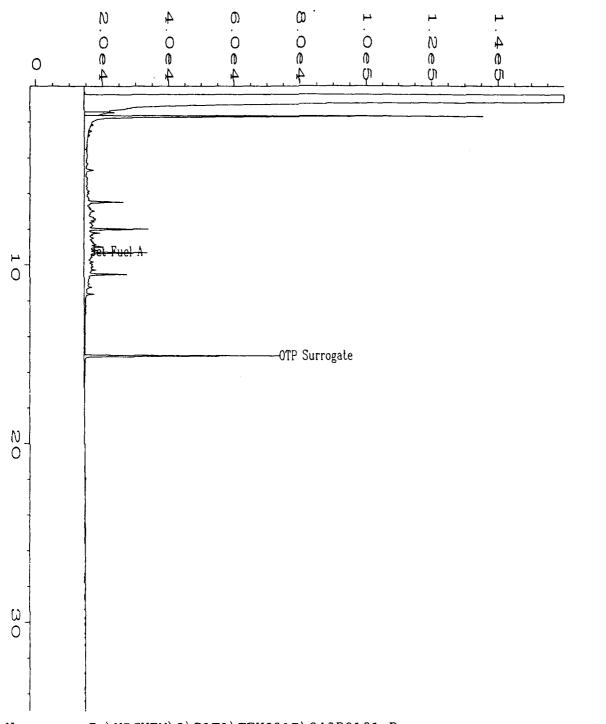
 Date Prepared
 : 3/17/95
 Method Blank
 : SB031795

Date Analyzed : 3/18/95

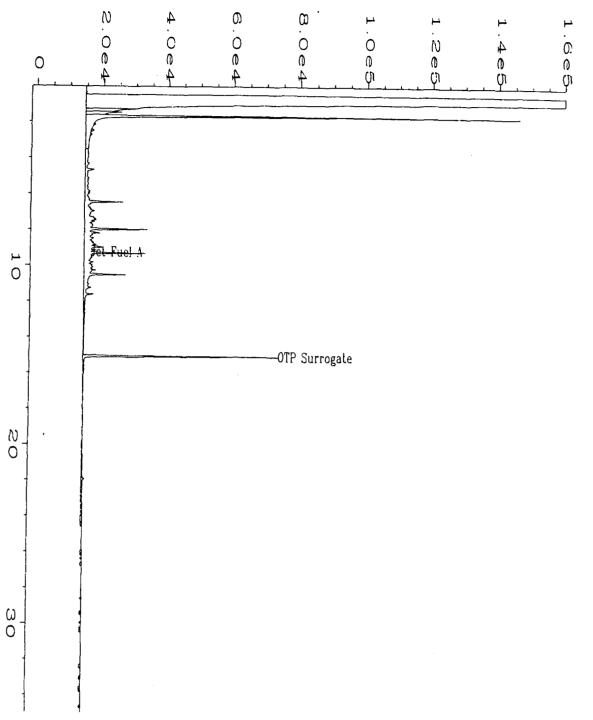
	Spike	Sample	MS		ac
Compound	Added	Concentration	Concentration	MS	Limits
	(ug/mL)	(ug/mL)	(ug/L)	%REC	%REC
Jet Fuel	1000	0	910	91	60-140

	Spike	MSD				C
Compound	Added	Concentration	MSD	RPD	Lir	nits
	(ug/mL)	(ug/mL)	%REC		RPD	%REC
Jet Fuel	1000	930	93	2.2	50	60-140

* = Values outside	of QC limits.
RPD:	out of (1) outside limits.
Spike Recovery:	O out of (1) outside limits.
Comments:	NA = Not analyzed/not applicable.
Values reported in u	g/mL in the liquid extract.



Data File Name : C:\HPCHEM\2\DATA\TEH0317\043R0101.D Operator : Dawn N. Guildner Page Number Instrument : TEH Vial Number : 43 Sample Name : X04163 MSD Injection Number: 1 n Time Bar Code: Sequence Line : 1 : 19 Mar 95 00:04 AM on: 11 Apr 95 12:24 PM Instrument Method: FID1BASE.MTH quired on Report Created on: 11 Apr 95 Analysis Method : JET0317.MTH Last Recalib on : 21 MAR 95 09:48 AM Sample Amount Multiplier ISTD Amount



Data File Name :	C:\HPCHEM\2\DATA\TEH0317\042		
Operator :	Dawn N. Guildner	J	1
Instrument :	TEH	Vial Number :	42
Sample Name :	X01463 MS	Injection Number :	1
Run Time Bar Code:		Sequence Line :	1
Acquired on :	18 Mar 95 11:14 PM	Instrument Method:	FTD1BAS
Raport Created on:	11 Apr 95 12:24 PM	Analysis Method :	JETO317 MC
Last Recalib on :	21 MAR 95 09:48 AM	Sample Amount :	0210317.141
Multiplier :	1	ISTD Amount .	

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Evergreen Analytical, Inc. 4036 Youngfield, Wheat Ridge, CO 80033 (303) 425-6021

BTEX Water Matrix Spike/Matrix Spike Duplicate Data Report

Client Project No.

: 722450.21020

Client Sample No.

: 24MP-6(4-6)

: 95-0820

MacDill

Lab Sample No. Date Sampled

: X04179

Lab Project No. EPA Method No.

: 8020

Date Received

: 3/9/95 : 3/14/95

Matrix

: Soil

Date Prepared

: 3/18/95

Lab File Number(s)

: BX2031816

Date Analyzed

: 3/19/95

Method Blank

: MB031895

	Spike	Sample	MS		QC
Compound	Added	Concentration	Concentration	MS	Limits
	(ug/L)	(ug/L)	(ug/L)	%REC	%REC
Benzene	20.0	0.0	15	74	65-121
Toluene	20.0	0.8	15	69	69-117
Ethyl Benzene	20.0	0.0	14	71	68-118
m,p-Xylene	40.0	0.0	29	72	66-116
o-Xylene	20.0	0.0	14	70	73-117
Chlorobenzene	20.0	0.0	14	70	65-121
1,3,5-TMB	20.0	0.0	13	63*	65-121
1,2,4-TMB	20.0	0.0	12	60*	65-121
1,2,3-TMB	20.0	0.0	11	54*	65-121
1,2,3,4-TeMB	20.0	0.0	7.5	38*	65-121

	Spike	MSD				C
Compound	Added	Concentration	MS	RPD	Lir	nits
	(ug/L)	(ug/L)	%REC		RPD	%REC
Benzene	20.0	NA	NA I	NA	17.4	65-121
Toluene	20.0	NA	NA	NA	15.8	69-117
Ethyl Benzene	20.0	NA	NA	NA	11.9	68-118
m,p-Xylene	40.0	NA	NA	NA	15.4	66-116
o-Xylene	20.0	NA	NA	NA	13.2	73-117
Chlorobenzene	20.0	NA	NA	NA	17.4	65-121
1,3,5-TMB	20.0	NA	NA	NA	17.4	65-121
1,2,4-TMB	20.0	NA	NA	NA	17.4	65-121
1,2,3-TMB	20.0	NA	NA	NA	17.4	65-121
1,2,3,4-TeMB	20.0	NA	NA	NA	17.4	65-121

* = Values outside of QC limits. See LCS 031895	= \	Values	outside of	OC limits	ue	263	031875
---	-----	--------	------------	-----------	----	-----	--------

RPD:

out of (10) outside limits. NA

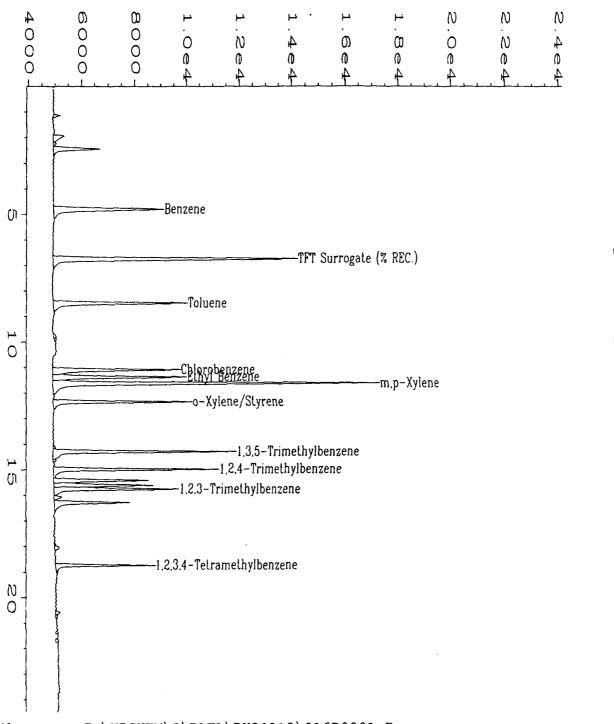
Spike Recovery:

out of (10) outside limits.

Comments

MSD on this sample did not purge.

Analyst



```
Data File Name
               : C:\HPCHEM\2\DATA\BX20318\016R0801.D
Operator
                                               Page Number
                 : C.J. Cook
Instrument
                                               Vial Number
                                                                 : 16
                 : BTEX2
Sample Name
                 : X04179MS DF=1
                                               Injection Number: 1
Run Time Bar Code:
                                               Sequence Line
                                                                : 8
Acquired on
                : 19 Mar 95 03:07 AM
                                                Instrument Method: BX20318
Report Created on: 19 Mar 95 01:36 PM
                                               Analysis Method : BX20318.MT
Last Recalib on : 18 MAR 95 11:33 PM
                                               Sample Amount
Multiplier
                                               ISTD Amount
Sample Info
                 : Project#: 95-0320 Client#: 24MP-6(4-6)
                                                           Soil
```

BTEX Data Report

		Client Project No.	: 722450.21020
Client Sample Number	: Trip Blank		MacDill
Lab Sample Number	: X04187	Lab Project No.	: 95-0820
Date Sampled	: 3/8/95	Dilution Factor	: 1.00
Date Received	: 3/14/95	Method	: 8020
Date Extracted/Prepared	: 3/17/95	Matrix	: Water
Date Analyzed	: 3/18/95	Lab File No.	: BX2031720
Methanol Extract?	: No	Method Blank No.	: MB031795

	Sample				
Compound Name	Cas Number	Concentration	PQL		
		ug/L	ug/L		
Benzene	71-43-2	U	4.0		
Toluene	108-88-3	U	4.0		
Ethyl Benzene	100-41-4	U	4.0		
Total Xylene	1330-20-7	U	4.0		
Chlorobenzene	108-90-7	U	4.0		
1,3,5-trimethylbenzene	108-67-8	U	4.0		
1,2,4-trimethylbenzene	95-63-6	U	4.0		
1,2,3-trimethylbenzene	526-73-8	U	4.0		
1,2,3,4-tetramethylbenzene	488-23-3	U	4.0		

Note: Total Xylene consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

Surrogate Recovery:

a,a,a,-Trifluorotoluene : 74% QC Reporting Limits : 70%-130%

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

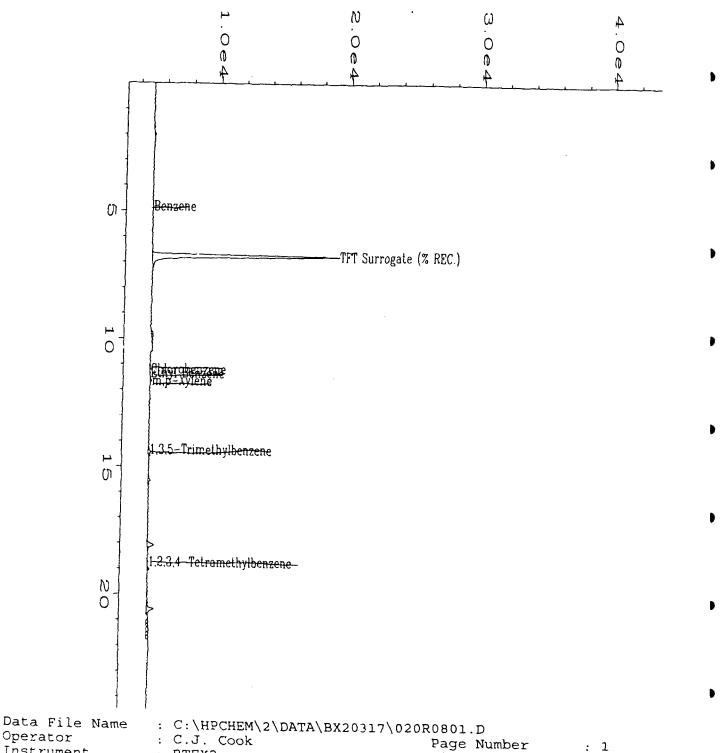
B = Compound fould in blank and sample. Compare blank and sample data.

J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available

VSt App



Operator Instrument : BTEX2 Vial Number : 20 Sample Name : X04187 DF=1 Injection Number: 1 Run Time Bar Code: Sequence Line : 8 Acquired on : 18 Mar 95 01:25 AM Report Created on: 18 Mar 95 02:31 PM Instrument Method: BX20317. Analysis Method : BX20317.MT: Last Recalib on : 18 MAR 95 01:39 PM Sample Amount : 0 Multiplier : 1 ISTD Amount

> 4/1/9K

BTEX Data Report Method Blank Report

Client Project No.

: 722450.21020

Method Blank Number : MB031795 Date Extracted/Prepared : 3/17/95

Lab Project No.

MacDill : 95-0820

Date Analyzed

: 3/17/95 : 3/17/94

Dilution Factor

: 1.00

Method

: 8020

Matrix

0020

: Water

Lab File No.

: BX2031709

		Sample	
Compound Name	Cas Number	Concentration	PQL
		ug/L	ug/L
Benzene	71-43-2	U	4.0
Toluene	108-88-3	U	4.0
Ethyl Benzene	100-41-4	U	4.0
Total Xylene	1330-20-7	U	4.0
Chlorobenzene	108-90-7	U	4.0
1,3,5-trimethylbenzene	108-67-8	U	4.0
1,2,4-trimethylbenzene	95-63-6	U	4.0
1,2,3-trimethylbenzene	526-73-8	U	4.0
1,2,3,4-tetramethylbenzene	488-23-3	U	4.0

Note: Total Xylene consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

Surrogate Recovery:

a,a,a,-Trifluorotoluene

90%

QC Reporting Limits

: 70%-130%

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

B = Compound found in blank and sample. Compare blank and sample data.

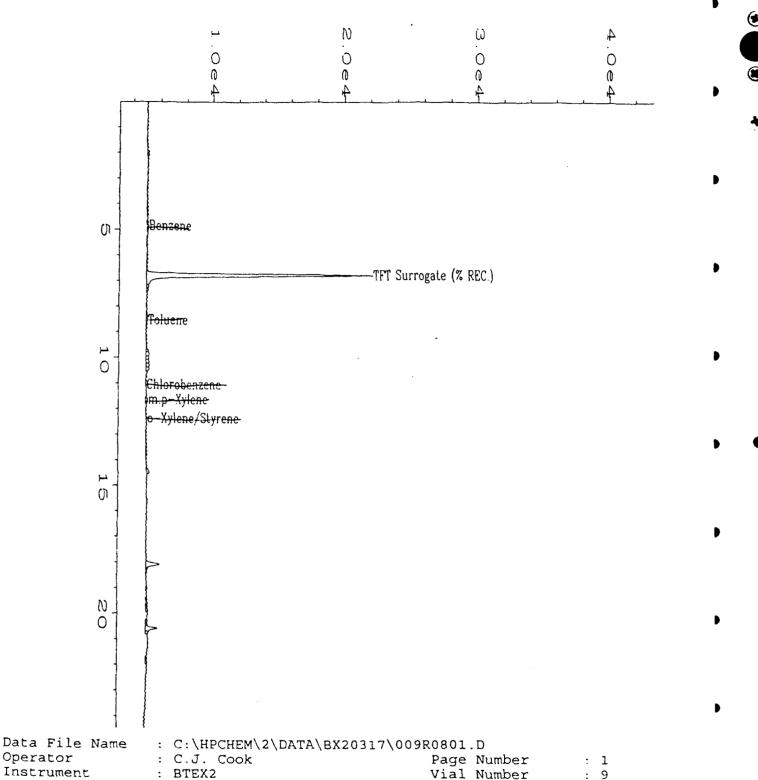
J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 18, Part II, pa. 8000-14.

NA = Not available.

Analyst

Approved



Instrument : BTEX2 Vial Number : 9
Sample Name : MB031795-WATER Injection Number : 1
Run Time Bar Code: Sequence Line : 8
Acquired on : 17 Mar 95 05:27 PM Instrument Method: BX20317.
Report Created on: 17 Mar 95 05:52 PM Analysis Method : BX20317.MTH
Last Recalib on : 17 Mar 95 04:23 PM Sample Amount : 0
Multiplier : 1 ISTD Amount :

-m 4/1/95

BTEX Data Report Method Blank Report

Client Project No.

: 722450.21020

Method Blank Number

: MB031895

MacDill

Date Extracted/Prepared

: 3/18/95

Lab Project No.

: 95-0820

Date Analyzed

: 3/19/94

Dilution Factor

: 1.00

Method

: 8020

Matrix

: Water

Lab File No.

: BX2031822

	Sample				
Compound Name	Cas Number	Concentration	PQL		
		ug/L	ug/L		
Benzene	71-43-2	υ	4.0		
Toluene	108-88-3	U	4.0		
Ethyl Benzene	100-41-4	U	4.0		
Total Xylene	1330-20-7	U	4.0		
Chlorobenzene	108-90-7	U	4.0		
1,3,5-trimethylbenzene	108-67-8	U	4.0		
1,2,4-trimethylbenzene	95-63-6	U	4.0		
1,2,3-trimethylbenzene	526-73-8	U	4.0		
1.2.3.4-tetramethylbenzene	488-23-3	U	4.0		

Note: Total Xylene consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

Surrogate Recovery:

a,a,a,-Trifluorotoluene

81%

QC Reporting Limits

: 70%-130%

QUALIFIERS:

E = Extrapolated value

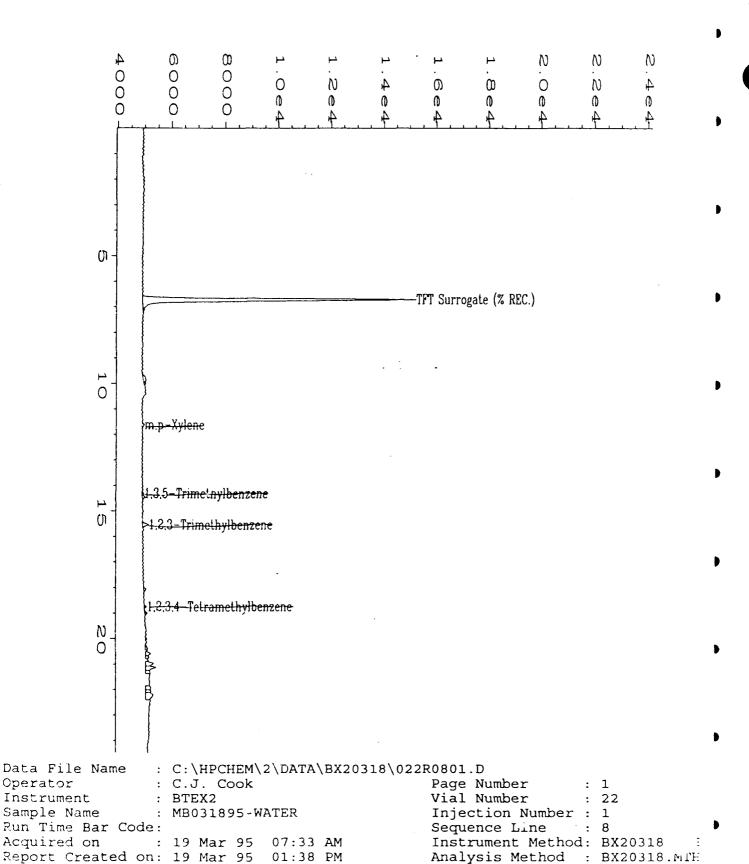
U = Compound analyzed for, but not detected.

B = Compound found in blank and sample. Compare blank and sample data.

J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available.



Analysis Method : BX20318.MTE

: 0

Sample Amount

ISTD Amount

Last Recalib on : 18 MAR 95 11:33 PM Multiplier P=7 4/0/95

BTEX Data Report Method Blank Report

Client Project No.

: 722450.21020

Method Blank Number

: MB031995

MacDill

Date Extracted/Prepared

: 3/19/95

Lab Project No.

: 95-0820

Date Analyzed

: 3/20/94

Dilution Factor

: 1.00

Method

: 8020

Matrix

: Water

Lab File No.

: BX2031914

Compound Name	Cas Number	Sample Concentration	PQL
Benzene	71-43-2	ug/L U	<u>ug/L</u> 4.0
Toluene	108-88-3	U	4.0
Ethyl Benzene	100-41-4	U	4.0
Total Xylene	1330-20-7	υ	4.0
Chlorobenzene	108-90-7	U	4.0
1,3,5-trimethylbenzene	108-67-8	υ	4.0
1,2,4-trimethylbenzene	95-63-6	U	4.0
1,2,3-trimethylbenzene	526-73-8	U	4.0
1,2,3,4-tetramethylbenzene	488-23-3	U	4.0

Note: Total Xylene consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

Surrogate Recovery:

a,a,a,-Trifluorotoluene

88%

QC Reporting Limits

: 70%-131%

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

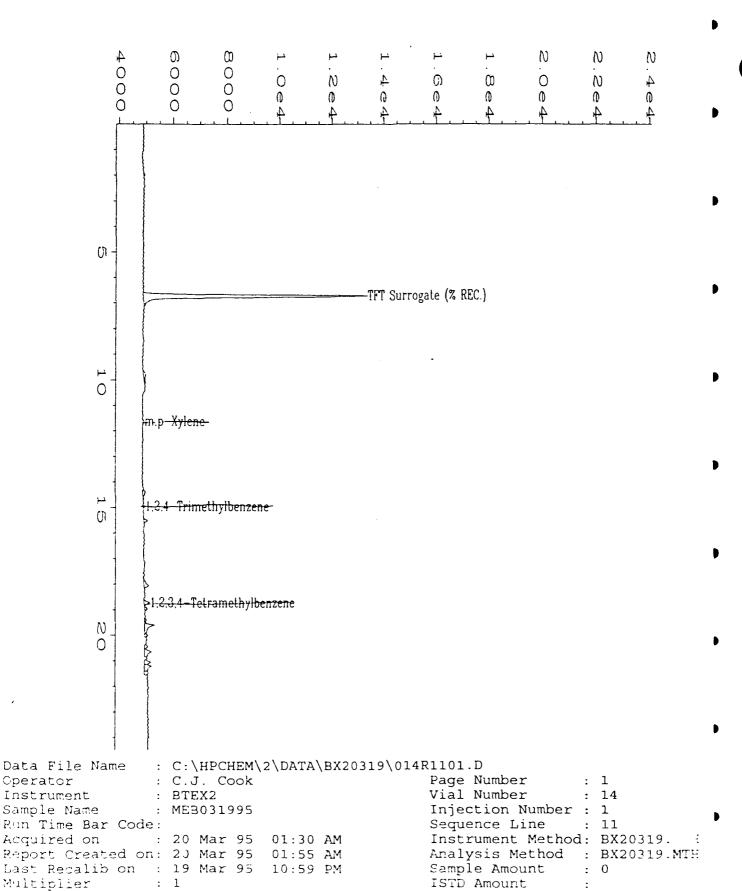
B = Compound found in blank and sample. Compare blank and sample data.

J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available.

Analyst



J. 1115

BTEX Data Report Method Blank Report

Method Blank Number

: MEB032095

: 722450.21020

Date Extracted/Prepared

: 3/20/95

Lab Project No.

Client Project No.

MacDill : 95-0820

Date Analyzed : 3/20/94

Dilution Factor

: 1.00

Method Matrix : 8020 : MeOH

Lab File No.

: BX2032013

Compound Name	Cas Number	Sample Concentration ug/L	PQL ug/L
Benzene	71-43-2	U	4
Toluene	108-88-3	U	4
Ethyl Benzene	100-41-4	U	4
Total Xylene	1330-20-7	U	4
Chlorobenzene	108-90-7	U	4
1,3,5-trimethylbenzene	108-67-8	U	4
1,2,4-trimethylbenzene	95-63-6	U	4
1,2,3-trimethylbenzene	526-73-8	υ	4
1,2,3,4-tetramethylbenzene	488-23-3	U	4

Note: Total Xylene consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

Surrogate Recovery:

a.a.a,-Trifluorotoluene

103%

QC Reporting Limits

: 70%-131%

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

B = Compound found in blank and sample. Compare blank and sample data.

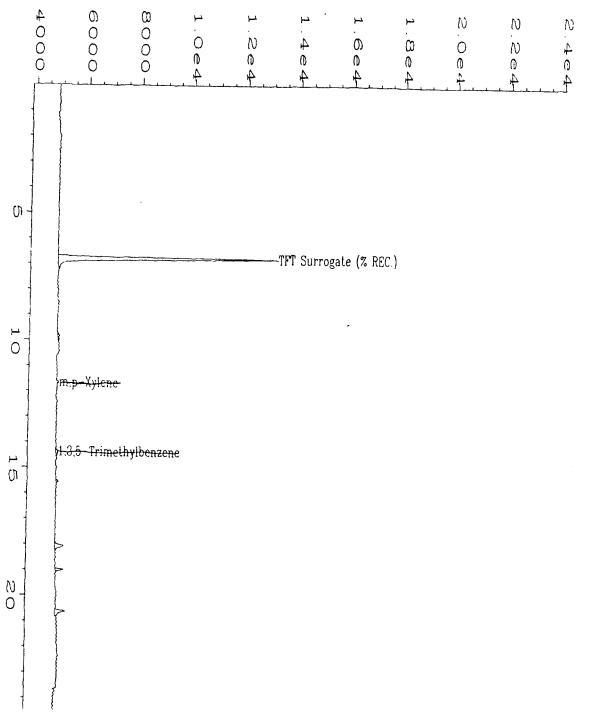
J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available.

Analyst

Approved



Instrument : Sample Name : Run Time Bar Code: Acquired on : Report Created on:	MEB032095 20 Mar 95 09:53 PM 20 Mar 95 10:19 PM	Page Number Vial Number Injection Number Sequence Line Instrument Method:	13 1 10 BX20320:
Last Recalib on : Multiplier :	20 Mar 95 06:26 PM	Analysis Method : Sample Amount : ISTD Amount :	0

BTEX Data Report Method Blank Report

Client Project No.

: 722450.21020

MacDill

Method Blank Number Date Extracted/Prepared : MB032095 : 3/20/95

Lab Project No.

: 95-0820

: 3/20/94 Date Analyzed

Dilution Factor

: 1.00

Method Matrix

: 8020 : Water

Lab File No.

: BX2032011

	Sample				
Compound Name	Cas Number	Concentration	PQL		
		ug/L	ug/L		
Benzene	71-43-2	U	4.0		
Toluene	108-88-3	U	4.0		
Ethyl Benzene	100-41-4	U	4.0		
Total Xylene	1330-20-7	U	4.0		
Chlorobenzene	108-90-7	U	4.0		
1,3,5-trimethylbenzene	108-67-8	U	4.0		
1,2,4-trimethylbenzene	95-63-6	U	4.0		
1,2,3-trimethylbenzene	526-73-8	U	4.0		
1,2,3,4-tetramethylbenzene	488-23-3	· U	4.0		

Note: Total Xylene consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

Surrogate Recovery:

a,a,a,-Trifluorotoluene

102%

QC Reporting Limits

: 70%-130%

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

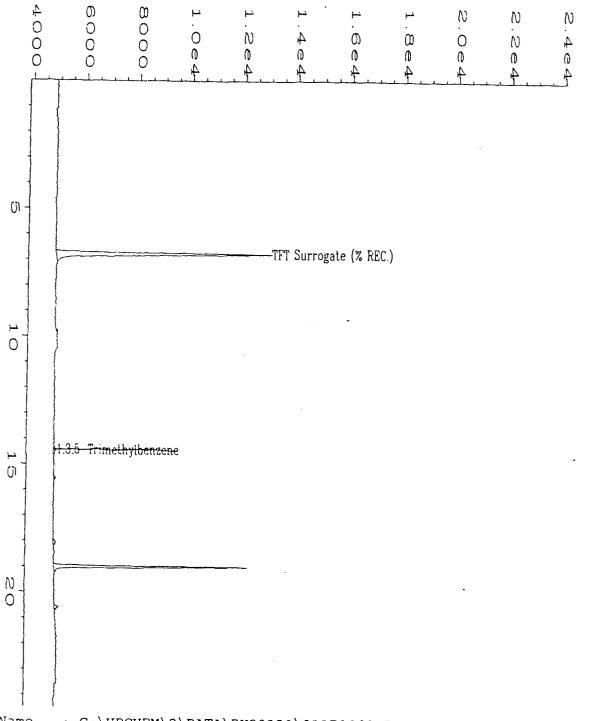
B = Compound found in blank and sample. Compare blank and sample data.

J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available.

Analyst



Data File Name : Operator : Instrument : Sample Name : Run Time Bar Code:	MB032095-WATER	Page Number : 1 Vial Number : 11 Injection Number : 1
Acquired on : Report Created on:	20 Mar 95 08:20 PM 20 Mar 95 08:45 PM 20 Mar 95 06:26 PM	Sequence Line : 10 Instrument Method: BX20320 Analysis Method : BX20320.MTH Sample Amount : 0 ISTD Amount :

from 4/13/65

BTEX Data Report Laboratory Control Sample (LCS)

LCS Number: LCS031895Dilution Factor: 1.00Date Extracted/Prepared: 3/18/95Method: 602Date Analyzed: 3/18/95Matrix: Water

Spike Amount (ug/L) : 40.0 **Lab File No**. : BX20318010

Compound Name	Cas N umber	LCS Concentration ug/L	LCS % Recovery	QC Limit % Recovery
Benzene	71-43-2	36.0	90.0%	57.5%-110.0%
Toluene	108-88-3	34.7	86.8%	65.0%-107.5%
Ethyl Benzene	100-41-4	35.5	88.8%	65.0%-120.0%
m,p-Xylene	NA	36.2	90.5%	62.5%-117.5%
o-Xylene	95-47-6	34.1	85.3%	65.0%-120.0%
Chlorobenzene	108-90-7	35.2	88.0%	70.0%-115.0%
1,3,5-trimethylbenzene	108-67-8	35.9	89.8%	60.0%-117.5%
1,2,4-trimethylbenzene	95-63-6	30.5	76.3%	57.5%-115.0%
1,2,3-trimethylbenzene	526-73-8	34.3	85.8%	72.5%-122.5%
1,2,3,4-tetramethylbenzene	488-23-3	34.6	86.5%	50.0%-150%
Surrogate Recovery (a,a,a-Trifluo	rotoluene):	95%	70%-130%	6 (QC limits)

QUALIFIERS:

E = Extrapolated value

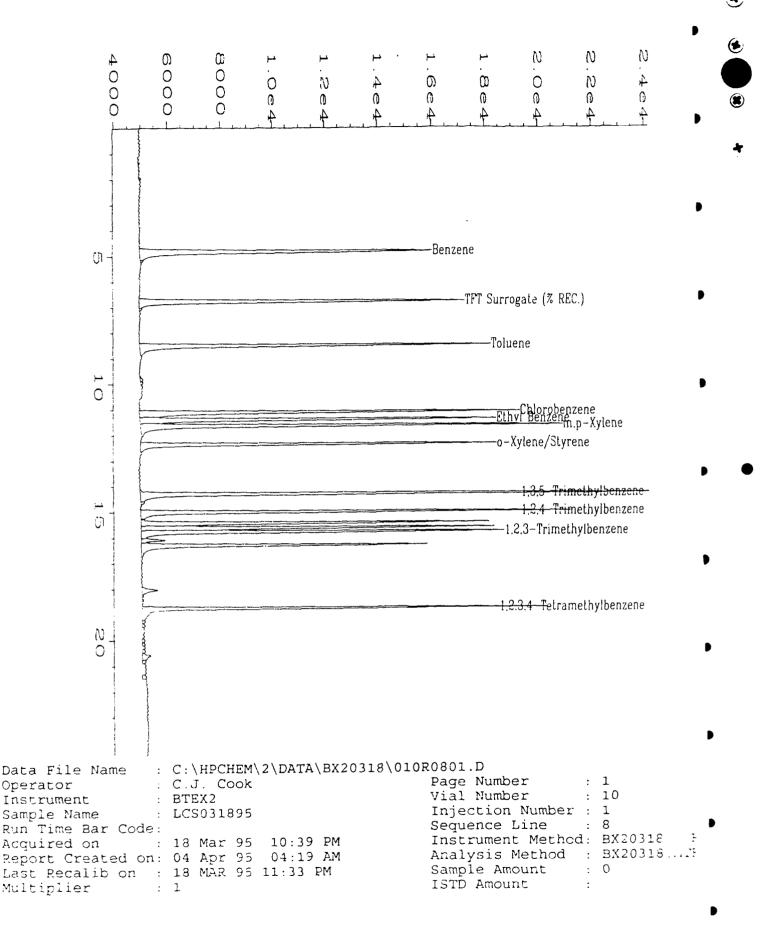
U = Compound analyzed for, but not detected.

B = Compound found in blank and sample. Compare blank and sample data.

J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

NA = Not available/Not analyzed

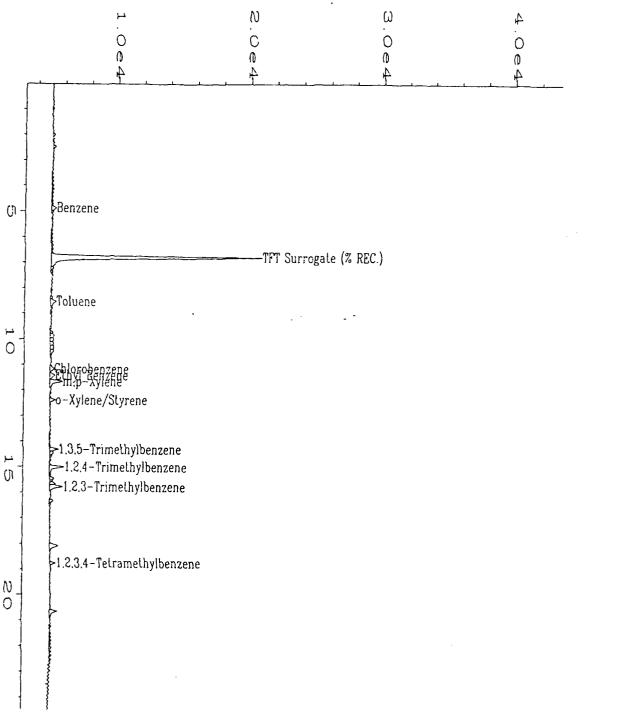
Analyst



• • •

External Standard Report : C.J. Cook ator Page Number :_BTEX2 Vial Number nstrument ample Name : 1.0 ppb BTEX MIX Injection Number : 1 un Time Bar Code: Sequence Line : 8 Instrument Method: BX20317.MTH : 17 Mar 95 04:43 PM cquired on eport Created on: 18 Mar 95 02:05 PM Analysis Method : BX20317.MTH ast Recalib on : 18 MAR 95 01:39 PM Sample Amount : 0 ultiplier : 1 ISTD Amount ig. 2 in C:\HPCHEM\2\DATA\BX20317\008R0801.D et Time Area Type Width Ref# ug/L Name 1156 PV 0.076 0.497 1 2.466 2629 VV 0.095 1 2.632 Benzene 4.867 81.851 TFT Surrogate (% REC.) 6.789 108107 VV 0.105 1-R 8.526 3772 VV 0.118 1 2.374 Toluene 2.707 Chlorobenzene 11.158 2728 VV 0.119 1 11.410 3157 VV 0.113 1 1.591 Ethyl Benzene 1.054 m,p-Xylene 11.654 6815 VV 0.104 1 12.379 2809 PV 0.094 1 1.931 o-Xylene/Styrene .316 3508 VV 0.074 1 0.778 1,3,5-Trimethylbenzene €007 0.801 1,2,4-Trimethylbenzene 7245 VV 0.090 1 15.455 1974 VV 0 091 1 1.830 15.569 803 VV 0.060 1 0.735 15.781 6531 VV 0.093 1 -1.117 1,2,3-Trimethylbenzene 16.325 1656 VV 0.082 1 18.759 1996 VV 0.069 1 0.576 1,2,3,4-Tetramethylbenzene

Time Reference Peak Expected RT Actual RT Difference 3 6.804 6.789 -0.015



```
ata File Name
                : C:\HPCHEM\2\DATA\BX20317\008R0801.D
perator
                : C.J. Cook
                                                Page Number
nstrument
                : BTEX2
                                                Vial Number
ample Name
                : 1.0 ppb BTEX MIX
                                                Injection Number: 1
un Time Bar Code:
                                                Sequence Line
squired on
                : 17 Mar 95
                              04:43 PM
                                                Instrument Method: BX20317.Ml..
eport Created on: 17 Mar 95
                              05:08 PM
                                                Analysis Method : BX20317.MTH
ast Recalib on : 17 Mar 95
                             04:23 PM
                                                Sample Amount
ultiplier
                                                ISTD Amount
ample Info
                : STD REF #1644, 3/10/95, 0.5 UG/ML (M & P-XYLENE PRESENT); +
                  1,2,3 & 1,2,4-Trimethylbenzene
```

External Standard Report Data File Name : C:\HPCHEM\2\DATA\BX20318\018\0801.D : C.J. Cook Page Number Onerator Vial Number : 18 strument strument : BTEX2
Sample Name : 1.0 ppb BTEX MIX Injection Number : 1 Run Time Bar Code: Sequence Line : 8 Instrument Method: BX20318.MTH Acquired on : 19 Mar 95 04:36 AM Report Created on: 19 Mar 95 01:36 PM Analysis Method : BX20318.MTH Sample Amount : 0 Last Recalib on : 18 MAR 95 11:33 PM : 1 ISTD Amount Multiplier : STD REF #1644, 3/10/95, 0.5 UG/ML (M & P-XYLENE PRESENT); + Sample Info 1,2,3 & 1,2,4-Trimethylbenzene Sig. 2 in C:\HPCHEM\2\DATA\BX20318\018R0801.D Ret Time Area Type Width Ref# ug/L Name 2.418 985 PV 0.100 1 0.909
4.776 2000 VV 0.114 1 2.263 Benzene
6.713 75070 PV 0.101 1-R 87.562 TFT Surrogate (% REC.)
8.469 1891 VV 0.090 1 1.678 Toluene
11.099 1318 PV 0.088 1 2.299 Chlorobenzene
11.368 1533 VV 0.094 1 1.121 Ethyl Benzene
11.602 3867 VV 0.091 1 0.0462 m,p-Xylene
12.323 1681 BV 0.082 1 1.330 o-Xylene/Styrene
14.273 2648 VV 0.077 1 0.423 1,3,5-Trimethylbenzene
14.967 4818 PV 0.079 1 1.263 1,2,4-Trimethylbenzene
15.240 * not found * 1
15.418 1124 VV 0.058 1 2.046 18.722 2932 PV 0.064 1 0.282 1,2,3,4-Tetramethylbenzene

Time Reference Peak Expected RT Actual RT Difference 3 6.750 6.713 -0.037

Not all calibrated peaks were found

```
N
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              0
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                  Benzene
           ()
                                                        -TFT Surrogate (% REC.)
                  ⊳Toluene ~
            0
                  >o-Xylene/Styrene /
                  ►1.3.5-Trimethylbenzene
            4
                   <del>--</del>1.2.4-Trimethylbenzene ✓
            O
                    -1,2,3-Trimethylbenzene /
                                                 & DV
                     <u>-1.2.3.4 – Tetramethylbenzene 🖊</u>
            N
            0
                  : C:\HPCHEM\2\DATA\BX20318\018R0801.D
Data File Name
                                                         Page Number
                    : C.J. Cook
                                                         Vial Number
                    : BTEX2
Instrument
                                                         Injection Number: 1
                    : 1.0 ppb BTEX MIX
Sample Name
                                                         Sequence Line
                                                                             : 8
Run Time Bar Code:
                                                         Instrument Method: BX20318.
                                    04:36 AM
                    : 19 Mar 95
Acquired on
                                                         Analysis Method : BX20318.MTH
Report Created on: 19 Mar 95
                                  01:36 PM
                   : 18 MAR 95 11:33 PM
                                                         Sample Amount
Last Recalib on
                                                         ISTD Amount
Multiplier
                    : STD REF #1644, 3/10/95, 0.5 UG/ML (M & P-XYLENE PRESENT); +
Sample Info
                      1,2,3 & 1,2,4-Trimethylbenzene
```

Operator

```
External Standard Report
Data File Name : C:\HPCHEM\2\DATA\BX20320\\010\R1001.D
rator : C.J. Cook
                                     / Page Number
                                      Vial Number : 10
trument : BTEX2
Sample Name : 1.0 ppb BTEX MIX
                                    Injection Number: 1
Sequence Line: 10
Instrument Method: BX20320.MTH
Analysis Method: BX20320.MTH
Run Time Bar Code:
Acquired on : 20 Mar 95 07:34 PM Report Created on: 20 Mar 95 07:59 PM
                                     Sample Amount : 0
Last Recalib on : 20 Mar 95 06:26 PM
Multiplier
                                      ISTD Amount
         : 1
Sample Info
            : STD REF #1644, 3/10/95, 0.5 UG/ML (M & P-XYLENE PRESENT); +
              1,2,3 & 1,2,4-Trimethylbenzene
Sig. 2 in C:\HPCHEM\2\DATA\BX20320\010R1001.D
Ret Time Area Type Width Ref# ug/L
                                               Name
            724 BV 0.074 1 2.086
3314 VV 0.086 1 0.119 1,2,3-Trimethylbenzene
 .5.444

6.771
 16.089 * not found *
                          1
 18.751
             1242 PV 0.075 1 1.846 1,2,3,4-Tetramethylbenzene
     Time Reference Peak Expected RT Actual RT Difference
                             6.750
                                       6.775
                                                   0.025
Not all calibrated peaks were found
```

```
0
                                                                      N
                                                                                    N
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                  bBenzene/
            OI -
                                                -TFT Surrogate (% REC.)
                  Foluene /
            0
                  ⊳o-Xylene/Styrene /
                  ▶1.3.5-Trimethylbenzene <
                  1,2,4-Trimethylbenzene
            ()
                  1.2.3-Trimethylbenzene
                  ►1.2.3.4-Tetramethylbenzene 🗸
            N
            0
Data File Name
                  : C:\HPCHEM\2\DATA\BX20320\010R1001.D
                    : C.J. Cook
                                                        Page Number
Instrument
                    : BTEX2
                                                        Vial Number
                                                                            : 10
Sample Name
                    : 1.0 ppb BTEX MIX
                                                        Injection Number: 1
Run Time Bar Code:
                                                        Sequence Line
                                                                            : 10
Acquired on
                      20 Mar 95
                                                        Instrument Method: BX20320.
                                   07:34 PM
Report Created on: 20 Mar 95
                                   07:59 PM
                                                        Analysis Method : BX20320.MTF
Last Recalib on : 20 Mar 95
                                   06:25 PM
                                                        Sample Amount
                                                                            : 0
```

1,2,3 & 1,2,4-Trimethylbenzene

: STD REF #1644, 3/10/95, 0.5 UG/ML (M & P-XYLENE PRESENT);

ISTD Amount

Operator

Multiplier

Sample Info





TOTAL VOLATILE HYDROCARBONS (TVH)

Date Sampled

: 3/8,9,10,13/95

Client Project Number

: 722450.21020/MAC DILL

Date Received

: 3/14/95

Lab Project Number

: 95-0820

Date Prepared

: 3/16,17,22,24/95

Matrix

: Soil

Date Analyzed

: 3/16,17,22,24/95

Method Number

: 5030/Mod.8015

Evergreen	Client	Surrogate	TVH*	RL*
Sample #	Sample #	Recovery	mg/Kg	mg/Kg
MB031695	METHOD BLANK	100%	U	0.10
MB032295	METHOD BLANK	100%	U	0.10
MB032395	METHOD BLANK	90%	U	0.10
X04173	24 MP-1A(3'-4')	116%	U	0.11
X04174	24 MP-1B(8'-9')	118%	1.1	0.12
X04175	24 MP-2(3'-4')	115%	υ	0.12
X04176	24 MP-3 (3-5)	112%	0.36	0.12
X04177	24-MP-4 (3-5)	115%	U	0.12
X04178	24 MP-5 (3-5)	113%	υ	0.12
X04179	24 MP-6 (4-6)	114%	U	0.12
X04181	24\$\$-1 (4-6)	120%	4.7	0.1
X04182	24SS-2 (4-6)	118%	3.0	0.1
X04183	75SS-1 (3-5)	108%	230	6.0
X04183 DUP	75\$\$-1 (3-5)	113%	590	6.0
X04184	75SS-1 (7-9)	101%	0.36	0.12
X04185	75SS-2 (3-5)	128%	4800E	5.7
X04186	75SS-2 (9-11)	101%	U	0.12
X04186 DUP	75SS-2 (9-11)	116%	0.41	0.12

QUALIFIERS

U = TVH analyzed for but not detected.

B = TVH found in blank as well as sample (blank data should be compared).

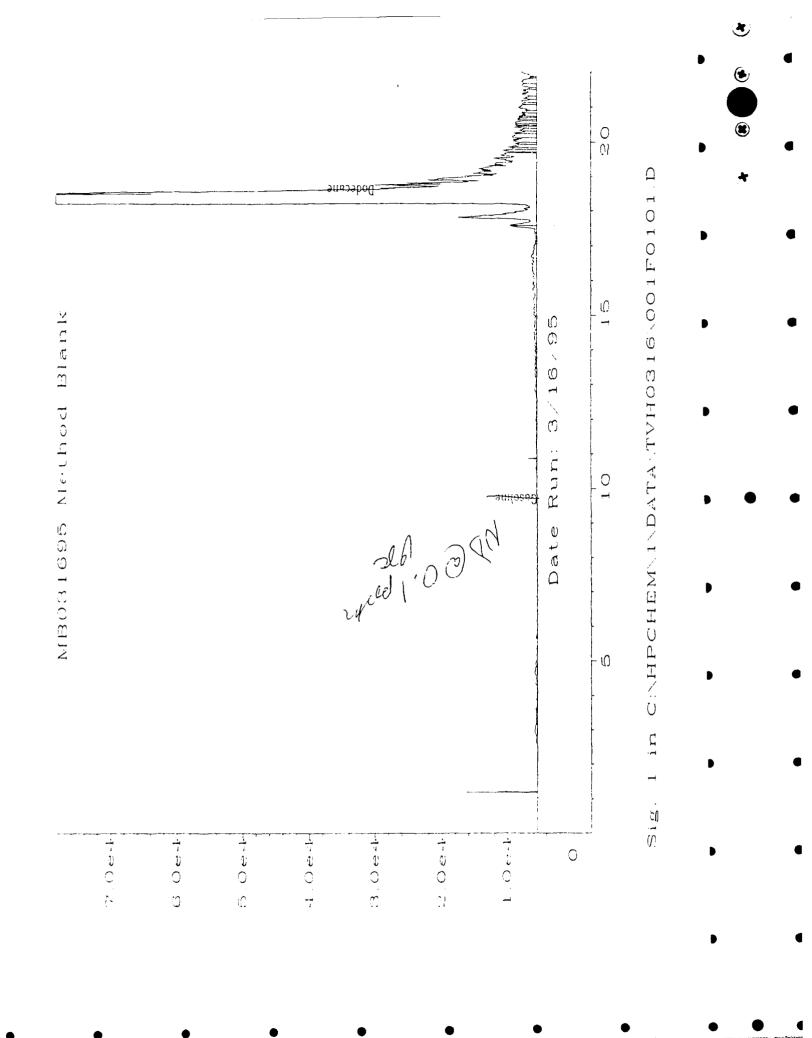
E = Extrapolated value.

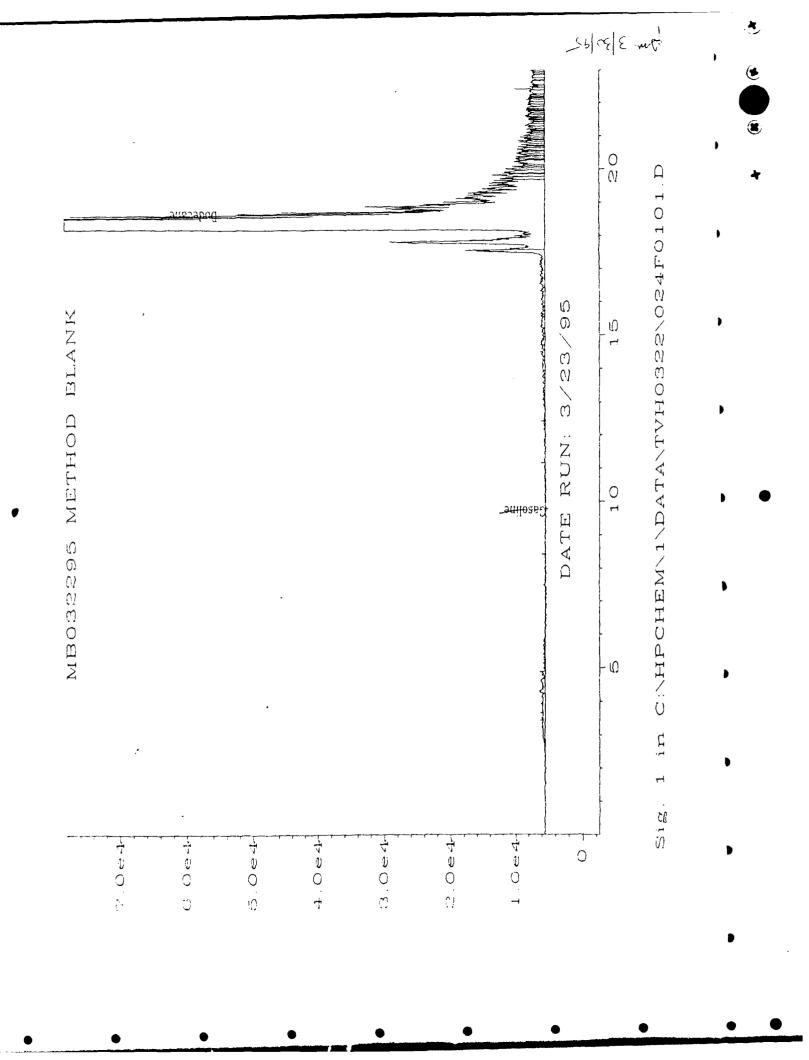
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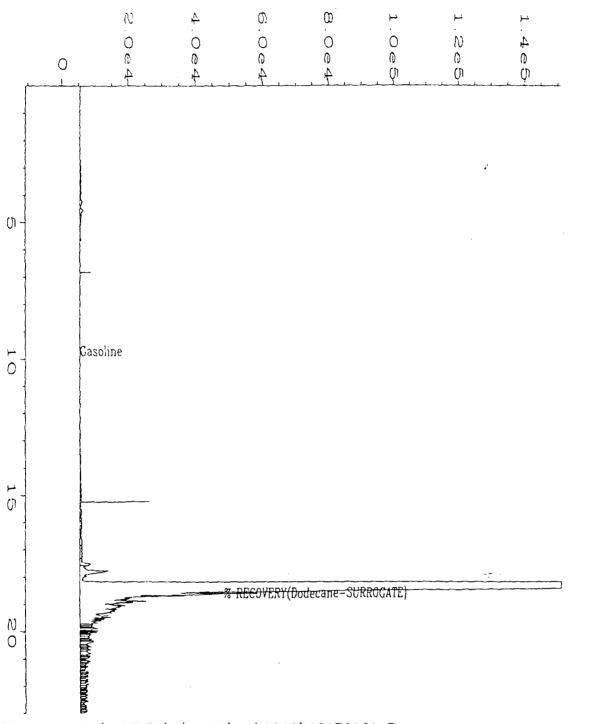
* = Based on dry weight.

Approved

Analyst





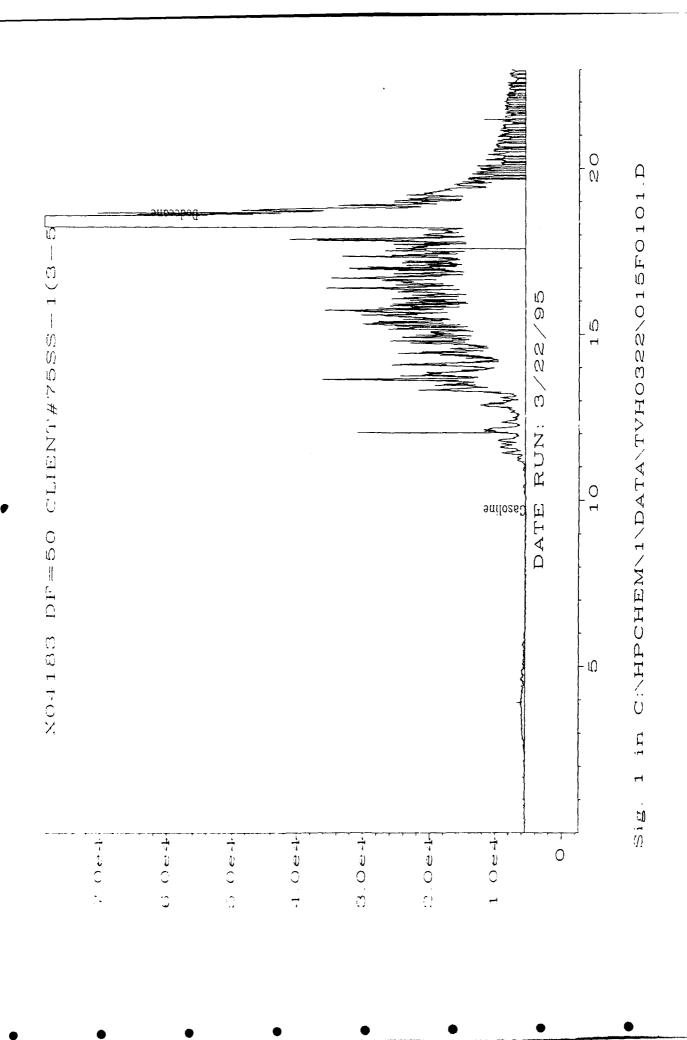


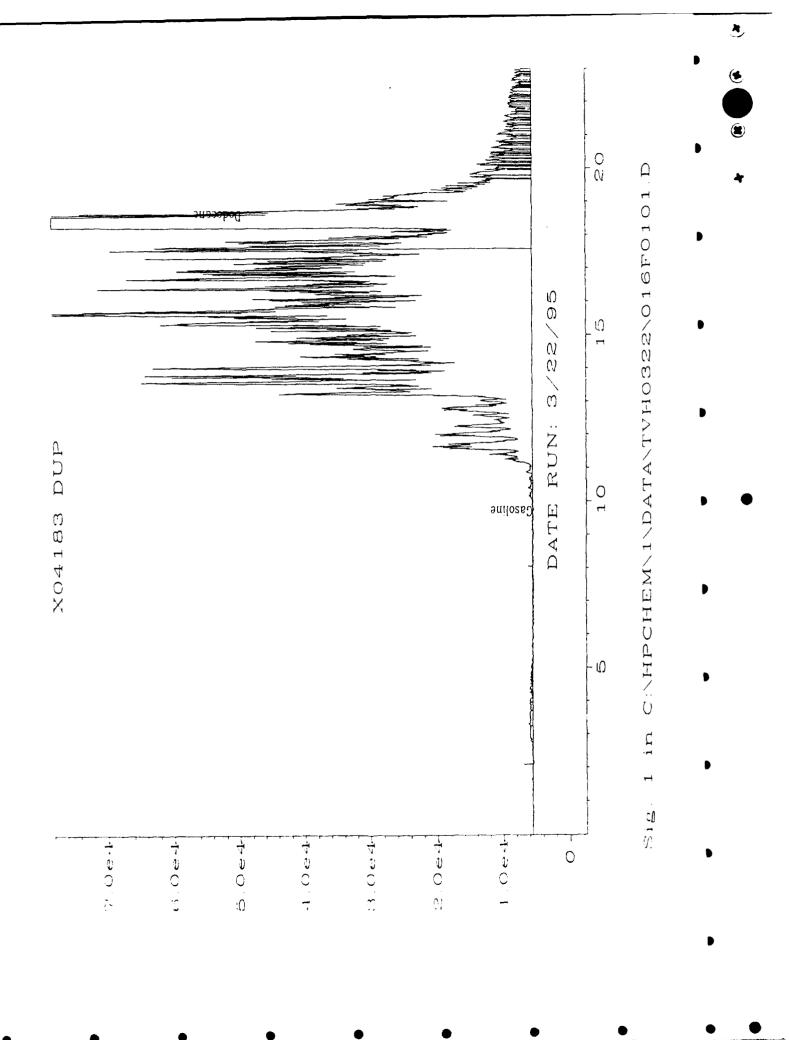
: C:\HPCHEM\1\DATA\tvh0323\001F0101.D ata File Name Page Number perator : Dawn N. Guildner Vial Number nstrument : TVH : 1 Injection Number : 1
Sequence Line : 1 : MB032395 ample Name un Time Bar Code: : 23 Mar 95 05:56 PM Instrument Method: TVH0323.MTh squired on eport Created on: 23 Mar 95 06:20 PM Analysis Method : TVH0323.MTH Sample Amount ast Recalib on : 23 MAR 95 12:18 PM : 0 ISTD Amount ultiplier

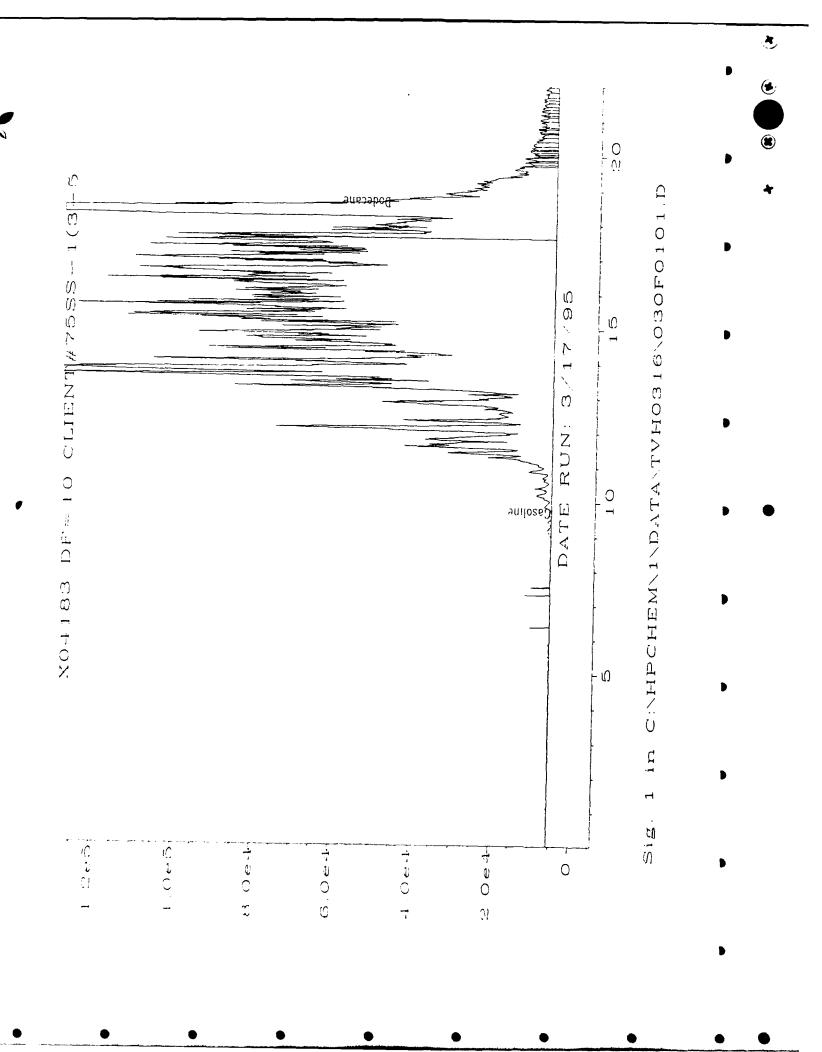
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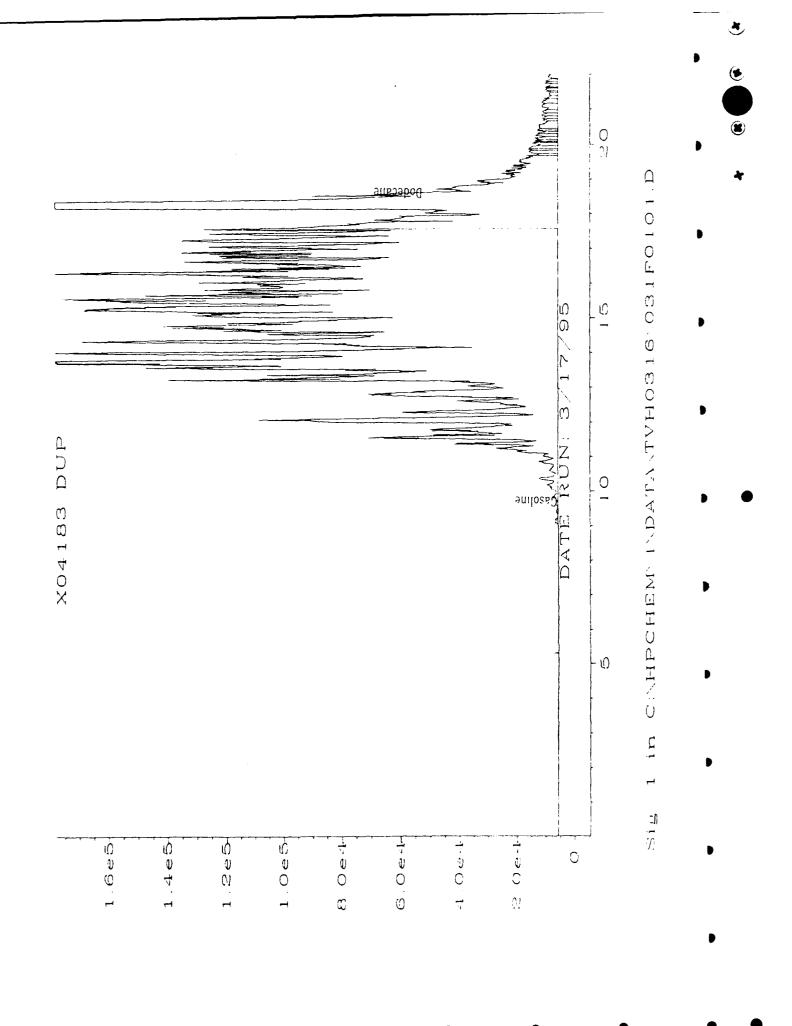
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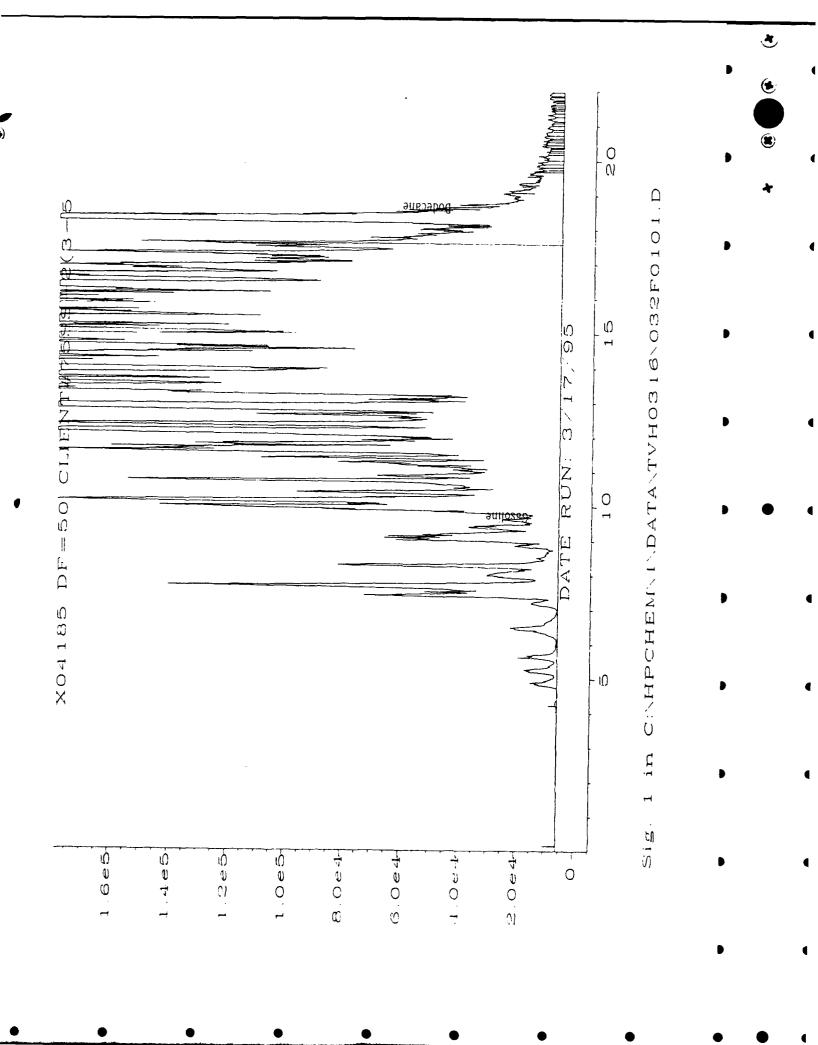
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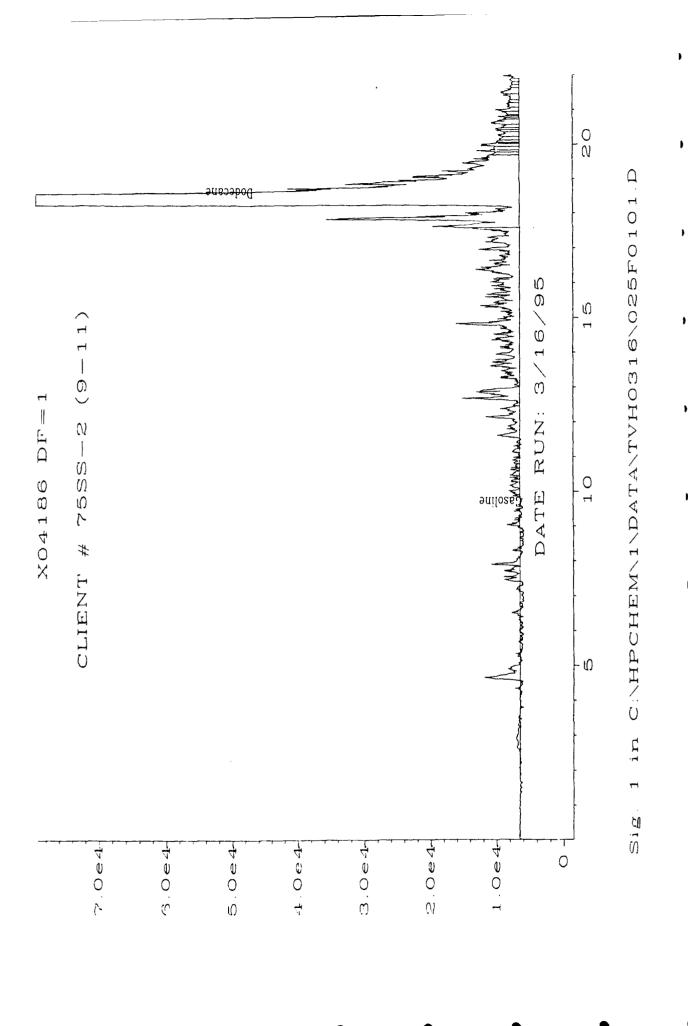


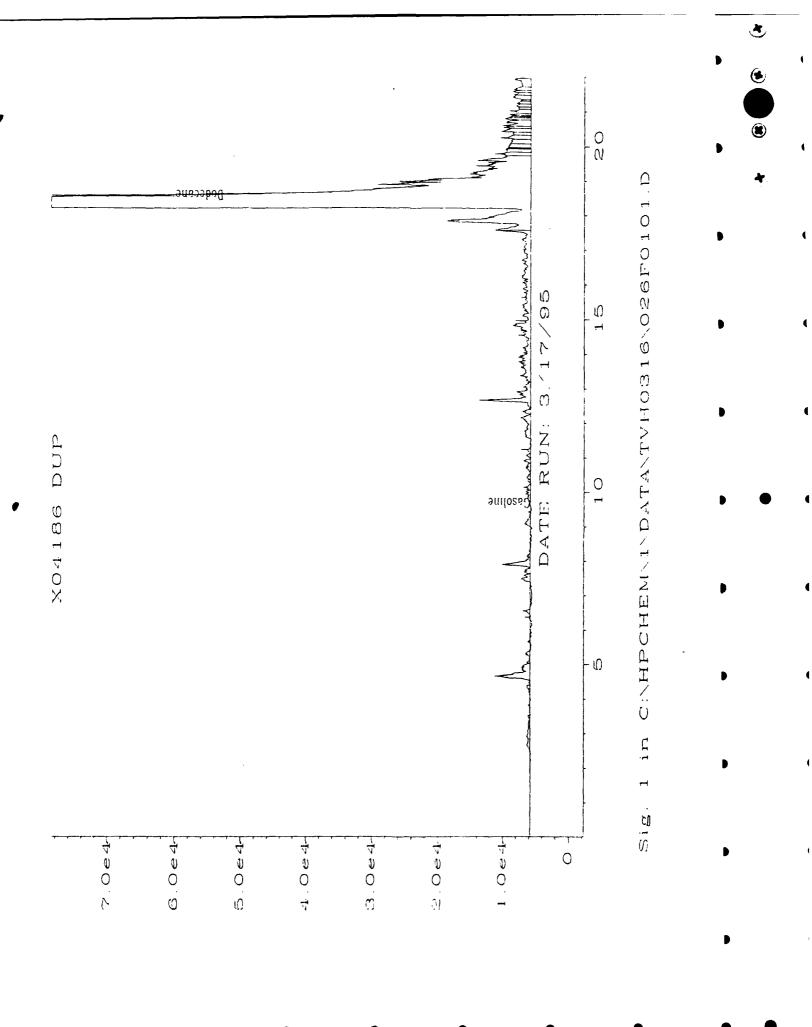


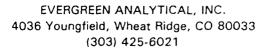














TOTAL VOLATILE HYDROCARBONS (TVH) Laboratory Control Sample (LCS)

LCS Number

: LCS031695 : 3/16/95 Client Project Number

: 722450.21020/MACDILL AFB

Date Prepared Date Analyzed

: 3/16/95

Lab Project Number Matrix : 95-0820 : SOIL

Sequence Number

: TVH12

Method Number

: 5030/8015 MOD.

	LCS		
Compound Name	Theoretical Concentration mg/L	Concentration mg/ L	QC Limit mg/L
Gasoline	5.00	6.21	3.5-6.5

QUALIFIERS

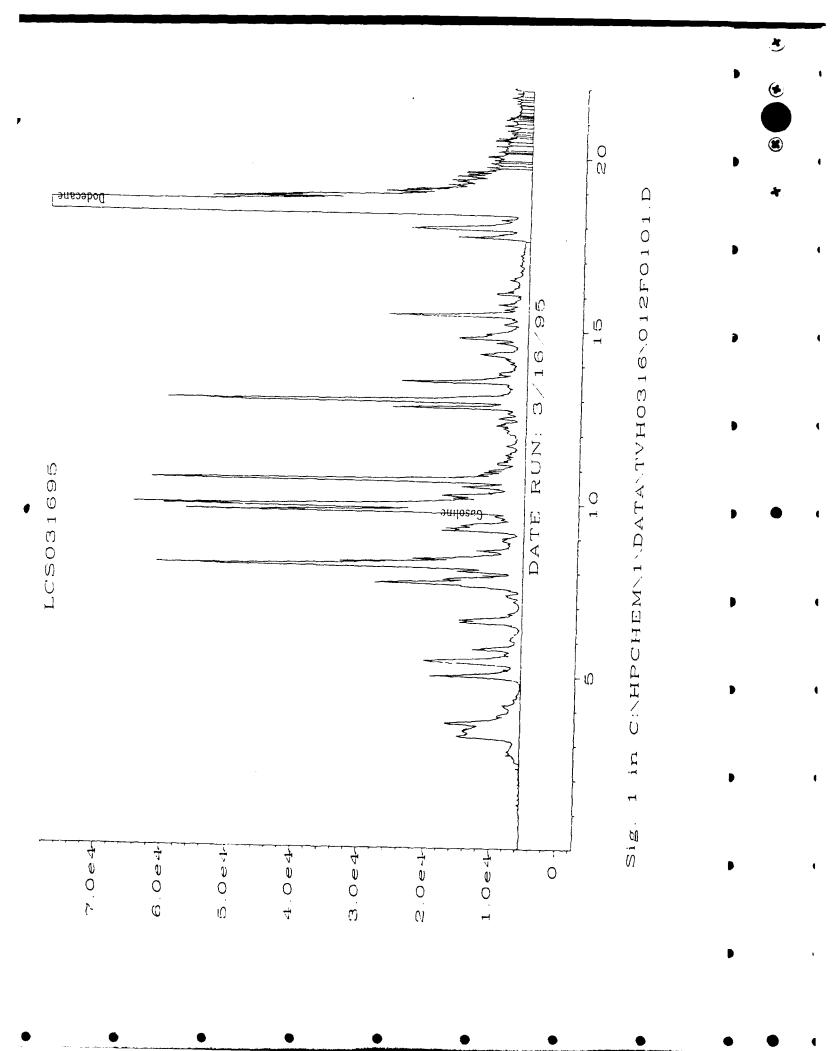
U = TEH analyzed for but not detected.

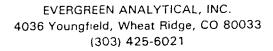
B = TEH found in blank as well as sample (blank data should be compared).

E = Extrapolated value.

NA = Not Available.

Approved







TOTAL VOLATILE HYDROCARBONS (TVH) Laboratory Control Sample (LCS)

LCS Number

: LCS032395

Client Project Number

: 722450.21020/MACDILL AFB

Date Prepared

: 3/23/95

Lab Project Number

: 95-0820

Date Analyzed

: 3/23/95

Matrix

: SOIL

Sequence Number

: TVH3

Method Number

: 5030/8015 MOD.

Compound Name	LCS		
	Theoretical Concentration mg/L	Concentration mg/ L	QC Limit mg/L
Gasoline	5.00	3.92	3.5-6.5

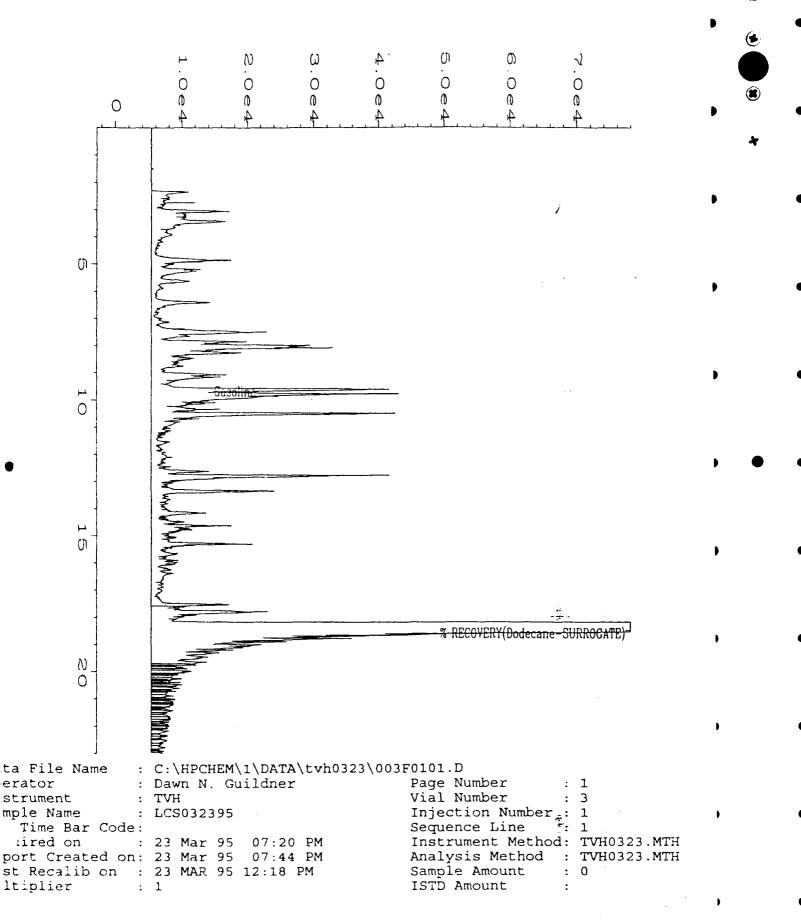
QUALIFIERS

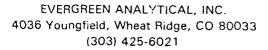
U = TEH analyzed for but not detected.

B = TEH found in blank as well as sample (blank data should be compared).

E = Extrapolated value.

NA = Not Available.







TOTAL EXTRACTABLE HYDROCARBONS (TEH) Jet Fuel Boiling Range

Date Sampled

: 3/8,9,10,13/95

Client Project Number

722450.21020/MAC DILL

Date Received

: 3/14/95

Lab Project Number

: 95-0820

Date Prepared

: 3/15,17/95

Matrix

: SOIL

Date Analyzed

: 3/18-20,22/95

Method Number

: 3500/MOD.8015

Evergreen	Client	Surrogate	TEH *	MDL
Sample #	Sample #	Recovery	mg/Kg	mg/Kg
SB031595	SOIL METHOD BLANK	81%	U	10
SB031795	SOIL METHOD BLANK	77%	U	10
X04173	24 MP-1A(3'-4')	87%	Ü	11
X04174	24 MP-1B(8'-9')	84%	140	12
X04175	24 MP-2 (3'-4')	89%	11	11
X04176	24 MP-3 (3-5)	85%	U	11
X04177	24 MP-4 (3-5)	85%	Ū	11
X04178	24 MP-5 (3-5)	85%	Ü	12
X04179	24 MP-6 (4-6)	83%	ΰ	12
X04181	24SS-1 (4-6)	90%	210	12
X04182	24\$\$-2(4-6)	80%	32	12
X04183	75SS-1 (3-5)	79%	13	12
X04185	75SS-2(3-5)	* *	15000	550
X04186	75SS-2(9-11)	78%	16	12
X04186 DUP	75SS-2(9-11)	86%	U	12

^{** =} Unable to separate surrogate from analyte.

QUALIFIERS

U = TEH analyzed for but not detected.

B = TEH found in blank as well as sample (blank data should be compared).

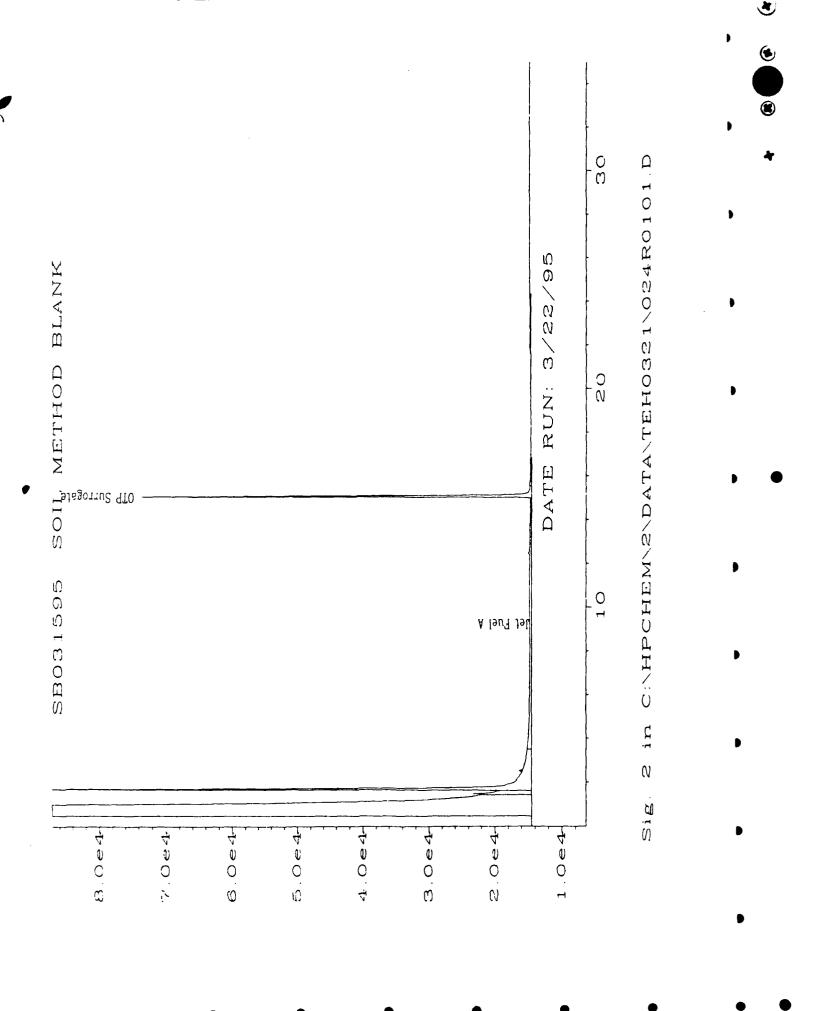
E = Extrapolated value.

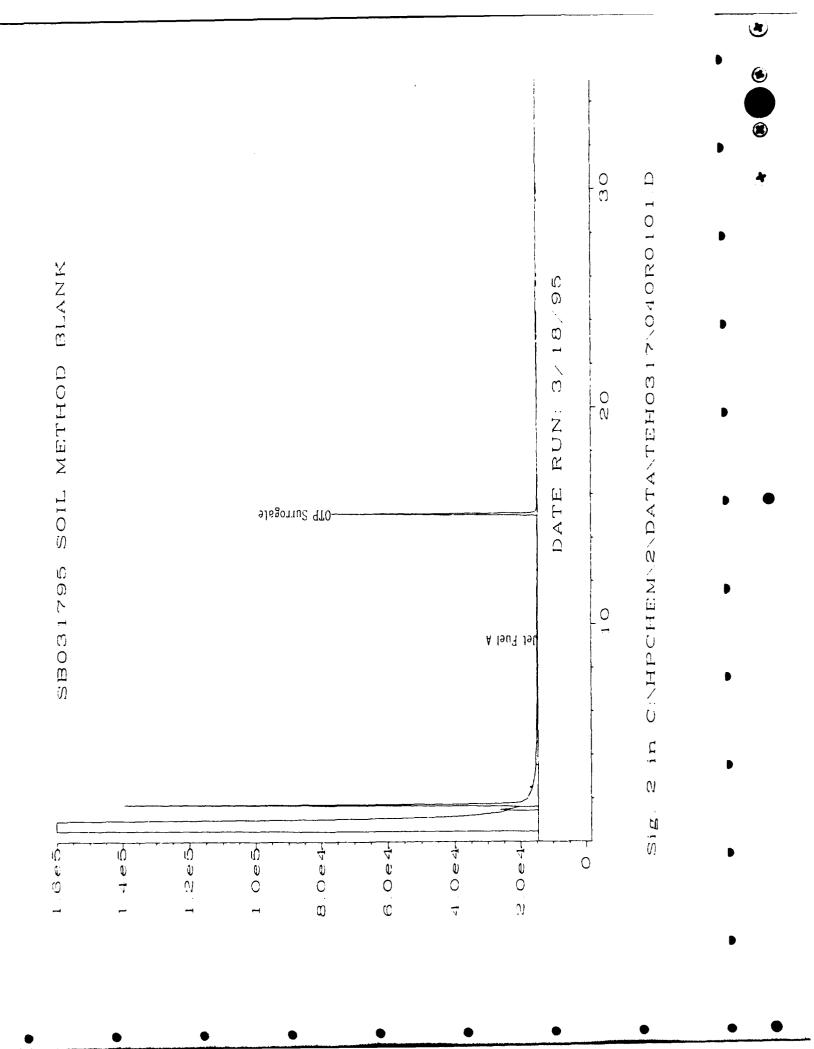
MDL = Method Detection Limit

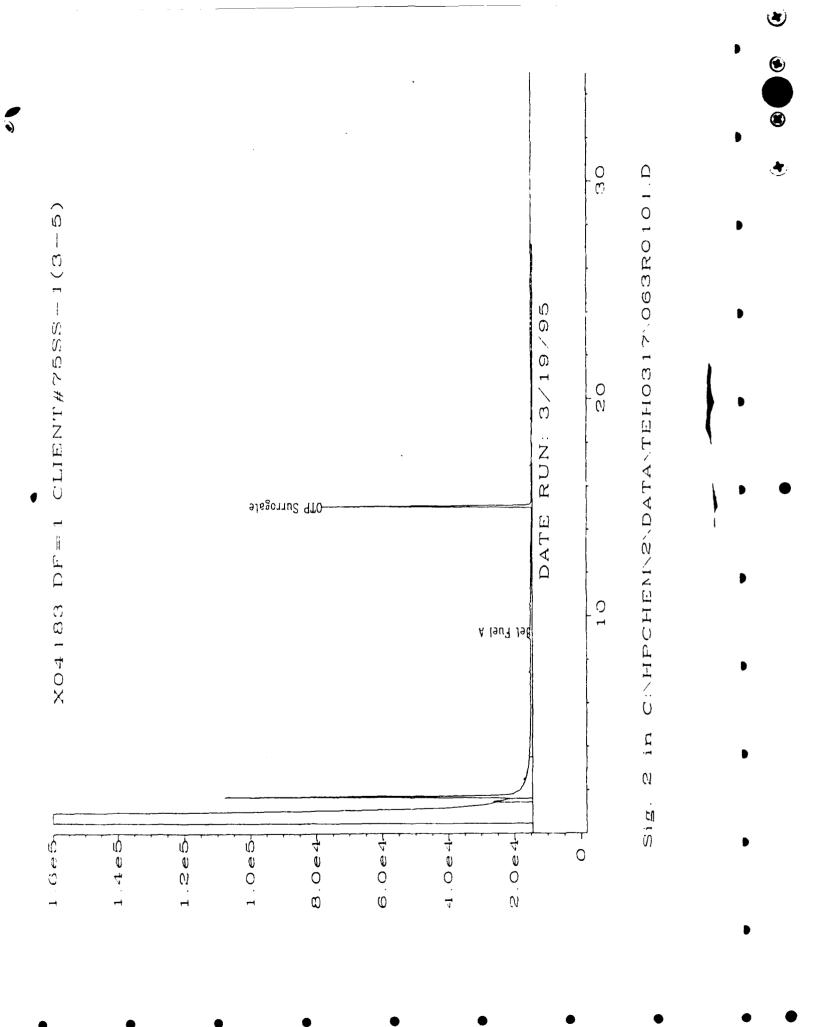
Approved

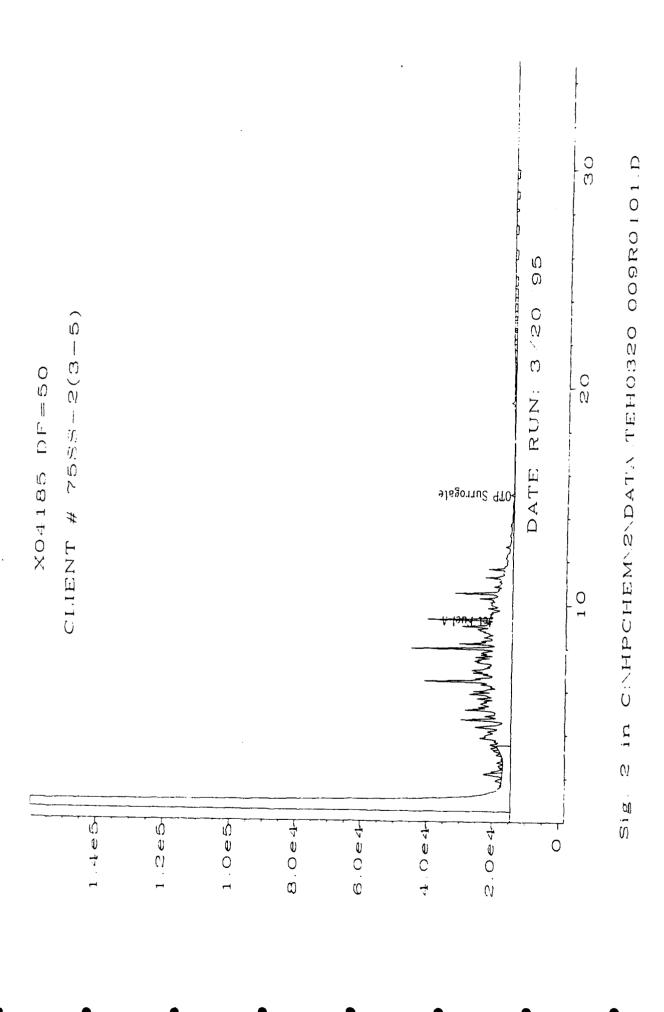
Analyst

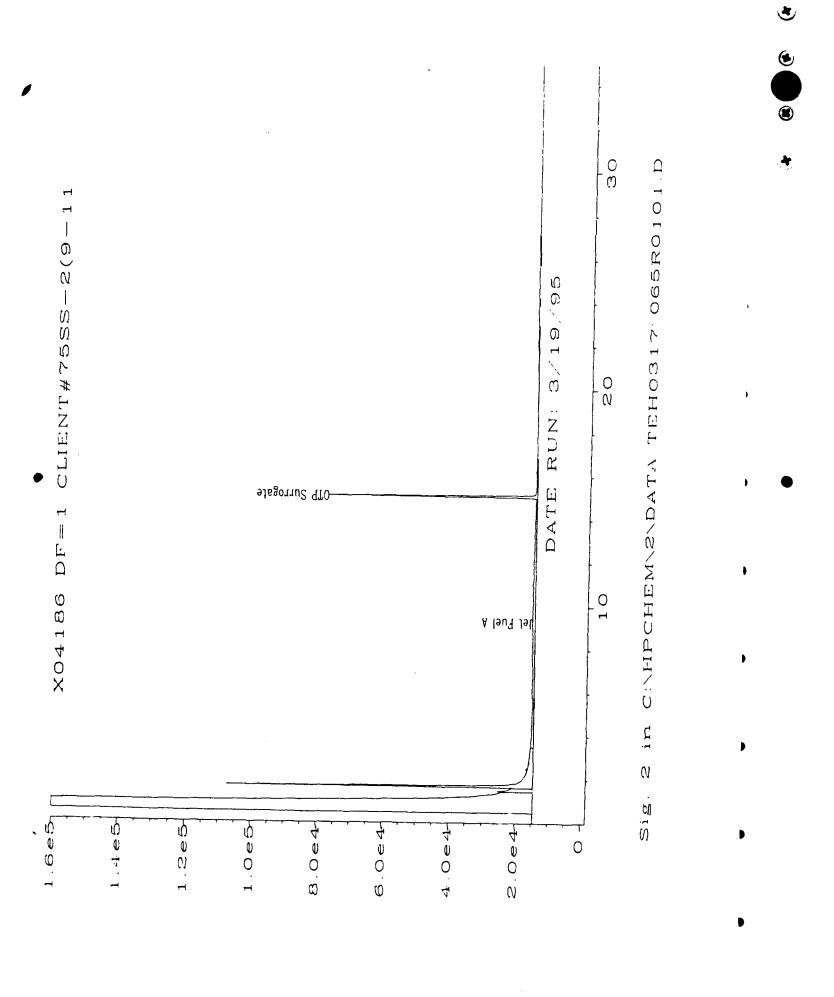
^{* =} Sample and MDL values are reported on a dry weight basis.

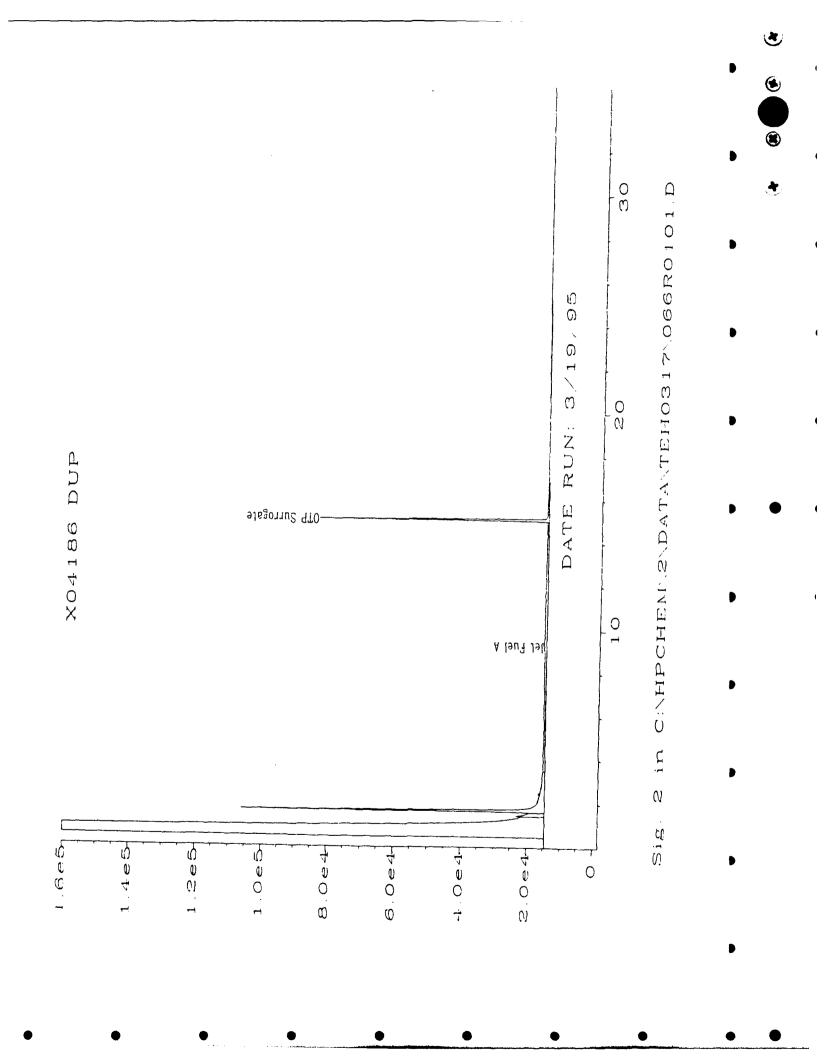














TOTAL EXTRACTABLE HYDROCARBONS (TEH) Laboratory Control Sample (LCS)

LCS Number

: LCS031595

Client Project Number

: 722450.21020/MAC DILL

Date Prepared

: 3/15/95

Lab Project Number

: 95-0820

Date Analyzed

: 3/18/95

Matrix

: SOIL

Sequence Number

: TEH21

Method Number

: 3500/Mod. 8015

 Compound Name
 Theoretical Concentration mg/L
 Concentration mg/Kg
 QC Limit mg/Kg

 JET FUEL
 1000
 960
 750-1750

QUALIFIERS

U = TEH analyzed for but not detected.

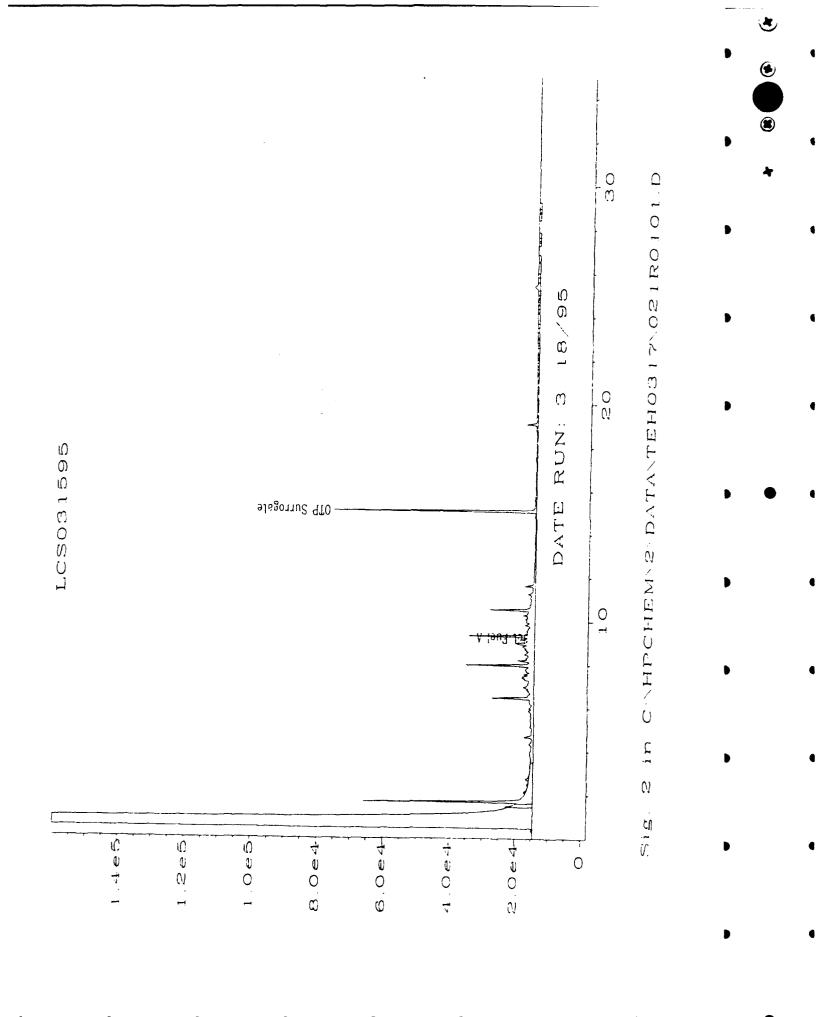
41 916. (

B = TEH found in blank as well as sample (blank data should be compared).

E = Extrapolated value.

NA = Not Available.

Analyst



Miscellaneous Analyses

Date Sampled : 3/8-13/95
Date Received : 3/14/95
Date Prepared : 3/15/95
Date Analyzed : 3/15/95 Client Project ID. : 722450.21020

Lab Project No. : 95-0820 Matrix

: Soil : EPA 160.3 Method

Evergreen Sample #	Client <u>Sample ID</u>	Moisture (%)
X04173	24MP-1A (3'-4')	10.1
X04174	24MP-1B (8'-9')	16.8
X04175	24MP-2 (3'-4')	16.1
X04176	24MP-3 (3-5)	14.6
X04177	24MP-4 (3-5)	14.8
X04178	24MP-5 (3-5)	17.5
X04179	24MP-6 (4-6)	17.6
X04181	24SS-1 (4-6)	16.0
X04182	24SS-2 (4-6)	13.7
X04183	75SS-1 (3-5)	16.7
X04185	75SS-2 (3-5)	11.3
X04186	75SS-2 (9-11)	18.0

Analyst

Approved

0420tm 4



LABORATORIES, INC.

Quality Analytical Services Since 1936 4630 Indiana Street - Colden, CO 80403

NON-CLP ANALYSIS RESULTS

Date:

03/24/95

Lab Name:

Huffman Labs

Contact:

Sue Zeller

Client: Evergreen Analytical Contact: Patty McClellan

Sample Matrix:

soil

Huffman Lab #: 143595

Instrument	Method	Sample	Analysis	Prep	Units	Results	Dilution	Element <i>i</i>	t Lab	Client
ID	#	Size (g)	Date	Date			Factor	Compound	# ID#	Smp#
#7	Leco CR12	2.195	03/23/95	NA	%	< 0.05	NA	TC	14359501	75SS-4 (3-4)
#7	Leco CR12	2.067	03/23/95	NA	%	< 0.05	NA	TC	14359501	75\$\$-4 (3-4)
#7	Laco CR12	2.154	03/23/95	NA	%	< 0.05	NA	TC	14359502	75SS-6 (3·5)
#7	Laco CA12	3.332	03/23/95	NA	%	< 0.05	NA	TC	14359503	75MP-7 (4-6)
#7	Leco CR12	2 889	03/23/95	NA	%	< 0.05	NA	TC	14359504	75MP-17 (4-6)
#7	Leco CR12	3.555	03/23/95	NA	%	< 0.05	NA	TC	14359505	24MP-7 (2-4)
#7	Lecc CR12	3.331	03/23/95	NA	%	0.21	NA	TC	14359506	24MP-3 (3-5)
#7	Leco CR12	2.908	03/23/95	NA	%	0.13	NA	TC	14359507	24MP-4 (3-5)
#7	Leco CR12	3.093	03/23/95	NA	%	2.21	NA	TC	14359508	24MP-6 (4-6)
#7	Leca CR12	3.394	03/23/95	NA	%	0.73	NA	TC	14359509	24MP-16 (4-6)
"tower"	COU-02	0.111	03/21/95	NA	%	< 0.02	NA	cc	14359501	75SS-4 (3-4)
"tower"	COU-02	0.259	03/21/95	NA	%	< 0.02	NA	cc	14359501	
"tower"	C0U-02	0.185	03/21/95	NA	%	< 0.02	NA	CC	14359502	75\$\$-6 (3-5)
"tow	COU-02	0.248	03/21/95	NA	%	< 0.02	NA	CC	14359503	75MP-7 (4-6)
tower	C0U-02	0.221	03/21/95	NA	%	< 0.02	NA	CC	14359504	75MP-17 (4-6)
"tower"	COU-02	0.127	03/21/95	NA	%	< 0.02	NA	CC	14359505	24MP-7 (2-4)
"tower"	COU-02	0.130	03/21/95	NA	%	< 0.02	NA	CC	14359506	
"tower"	COU-02	0.128	03/21/95	NA	%	< 0.02	NA	CC	14359507	24MP-4 (3-5)
"tower"	COU-02	0.138	03/21/95	NA	%	< 0.02	NA	CC	14359508	24MP-6 (4-6)
"tower"	COU-02	0.165	03/21/95	NA	% +}سر-	<0.02	NA	idebure CC	14359509	
NA	by calc	NA	NA	NA	%	< 0 05	NA	тос	14359501	755\$-4 (3-4)
NA	by calc	NΑ	NA	NA	%	< 0.05	NA	TOC	14359501	75\$\$-4 (3-4)
NA	by sale	NA	NA	NA	%	< 0.05	NA	TOC	14359502	7] 7585-6 (3-5)
NA	by calc	MA	NA	NA	%	< 0.05	NA	TOC	14359503	
NA	by_catc	NA_	NA NA	NA	%	< 0.05	NA	TOC	14359504	75MP-17 (4-6)
NA	by caic	NA	NA	NA	%	< 0.05	NA	TOC	14359505	9 24MP-7 (2-4)
NA	by calc	NA	NA	NA	.35 %	0.210	NA	TOC	14359506	
NA	by calc	NA	NA	NA	. 15 %	0.130	NA	TOC	14359507	24MP-4 (3-5)
NA	by calc	·NΑ	NA	NA	.68 %	2.212	NA	TOC	14359508	20 24MP-6 (4-6)
NA	by calc	NA	NA	NA	.87%	0.730	NA	TOC	14359509	24MP 16 (4-5)

Samples analyzed and results reported on an as received basis. Soil samples are not homogeneous.

Values reported below Detection Limits are for reference only.

TC detection limit = 0.05%
CC detection limit = 0.02%
TOC detection limit = 0.05%

e numbers to the left above represent the last four digits of the EAL project mber under which the samples were analyzed.

original report and quality control results are filed with EAL project 95-081



CASE NARRATIVE

Evergreen Analytical Project (EAL) #: 95-0819

Parsons Engineering Science, Inc. (PES) Project: MacDill AFB (722450.21020)

Sample Receipt
On March 13, 1995, eight soil samples and one Rinseate Blank were received in good condition at Evergreen Analytical Laboratory. Refer to the EAL Sample Log Sheet for specific log-in information and cross-reference of EAL and PES sample identifications.

BTEX, Chlorobenzene, 1,3,5-trimethylbenzene (TMB), 1,2,4-TMB,1,2,3-TMB, and 1,2,3,4-Tetramethylbenzene (TEMB), hereafter referred to as BTEX.

BTEX, Soil Matrix, Method SW8020
There were no quality control anomalies to report.

PES sample number 24MP-8(2-4) and 24MW-6(2-4) were analyzed at a dilution due to the inability to purge at DF=1. The reporting limits were raised accordingly.

Total Volatile Hydrocarbon (TVH), Soil Matrix, Method 8015M There were no quality control anomalies to report.

Total Extractable Hydrocarbons, (TEH), Soil Matrix, Method 8015M, JET-A.

There were no laboratory duplicates, matrix spike or matrix spike duplicate samples analyzed with this batch due to insufficient sample volume. There were no other quality control anomalies to report.

Total Organic Carbon in Soil
Total Organic Carbon (TOC) in Soil was analyzed by Huffman Research, Inc. of Golden, Colorado. TOC was determined by analyzing for total carbon (TC) and inorganic (carbonate) carbon (CC), then calculating the difference as TOC. The report from Huffman is included.

Patricia A. McClellan, Project Manager

Project # <u>95-0819</u> Evergreen Analytical Sample Log Sheet Date(s) Sampled: 03/10,11/95 COC Date Due: 03/17/95 Date Received: 03/14/95 1000 Holding Time(s):03/24,25-BTEX,TVH,T Client Project I.D. 722450.21020/MAC DILL Rush STANDARD Client: Parsons Engineering Science, Inc. Shipping Charges N/A___ Address: 1700 Broadway Suite 900 **B.A.** Cooler # 422 Denver, CO 80290 Airbill # 9581826225 FEDEX Contact: TODD WIEDEMEIER Custody Seal Intact? Cooler X Bottles _ Client P.O. ____ COC Present Y Y Sample Tags Present? Y Sample Tags Listed? Y Sample(s) Sealed? Special Invoicing/Billing_ Special Instructions REPORT SOILS ON A DRY WEIGHT BASIS. SPLUS TMB, TEMB AND CHLOROBENZENE. ANALYZE AN MS/MSD AND LAB DUPLICATE ON THIS CLIENT'S SAMPLES Lab Client ID# Analysis Mtx Btl ID # Loc X04163A/B 24MP-7(2-4) **\$BTEX 8020** S 2WM 2 24MP-8(2-4) S 2WM 2 X04164A/B **SBTEX 8020** S 2WM 2 X04165A/B 24MP-9(3-5)**\$BTEX 8020** 24MP-9(9-11) S 2WM 2 X04166A/B **SBTEX 8020** S 2WM 2 24MP-10(2-4) **\$BTEX 8020** X04167A/B X04168A/B 24MW-6(2-4)**SBTEX** 8020 S 2WM 2 2 S X04169A/B 24MW-6(9-11)**\$**BTEX 8020 2WM S 2 X04170A/B 175MP-1(3-5)SBTEX 8020 2WM W 40V 2 X04171A/B RINSATE BLANK **SBTEX 8020** W X04172A/B TRIP BLANK **SBTEX 8020** 40V 2 X04163C 24MP-7(2-4)TVH S 2WM 2 S 2 X04164C 24MP-8(2-4)TVH 2WM 2 X04165C 24MP-9(3-5) TVH S 2WM S 2 X04166C 24MP-9(9-11) HVT 2WM X04167C 24MP-10(2-4) TVH S 2WM X04168C 24MW-6(2-4) TVH S 2WM 2 X04169C 24MW-6(9-11) TVH S 2WM 2 X04170C 175MP-1(3-5) TVH S 2WM R=Sample to be returned Route GC/MS ___ Wet Chem 1 GC 4 Metals __ SxPrep 1 Acctg ___ To SxRec C QA/QC <u>C</u> Sales C File Oriq

Custodian/Date:

Page 1 of 2 Page(s)

Lab	Client	land in	7/4	D.4.1	•
ID #	ID#	Analysis	Mtx	Bt1	Loc
¥^ <u>4163D</u>	24MP-7(2-4)	TEH	S	2WM	B2
J4164D	24MP-8(2-4)	ТЕН	S	2WM	B2
X04165D	24MP-9(3-5)	TEH	<u>S</u>	2WM	B2
X04166D	24MP-9(9-11)	TEH	S	2WM	B2
X04167D	24MP-10(2-4)	TEH	S	2WM	B2
X04168D	24MW-6(2-4)	ТЕН	s	2WM	B2
X04169D	24MW-6(9-11)	ТЕН	s	2WM	B2
X04170D	175MP-1(3-5)	TEH	S	2WM	B2
X04163F	24MP-7(2-4)	% MOISTURE	S	4WM	B2
X04164E	24MP-8(2-4)	% MOISTURE	S	4WM	B2
X04165E	24MP-9(3-5)	% MOISTURE	S	4WM	B2
X04166E	24MP-9(9-11)	% MOISTURE	s	4WM	B2
X04167E	24MP-10(2-4)	% MOISTURE	S	4WM	B2
X04168E	24MW-6(2-4)	% MOISTURE	S	4WM	B2
X04169E	24MW-6(9-11)	% MOISTURE	S	4WM	B2
X04170E	175MP-1(3-5)	% MOISTURE	s	4WM	B2
X04163E	24MP-7(2-4)	TOC	s	2WM	our

Page 2 of 2 Pages
Project # 95-0819

R=Sample to be returned

CHAIN OF CUSTODY RECORD / ANALYTICAL SERVICES REQUEST

_				Fire	Evergroon Analytical Inc	Δ	st. die	al le	ç				Page & of	/ 50 /
COMPANY LOBORIS ES ADDRESS 1700 BITA LLUCY CITY LOAVET STATE CO ZIP PHONEN 331-3100	S029.	200				4036) Wheat (303) / FAX (3 (800) £	And younglield St. 4036 Younglield St. Wheat Hidge, Colorado 80033 (303) 425-6021 FAX (303) 425-6854 (800) 845-7400 FAX RESULTS Y / N	d St. Colorado 6854 S Y /	80033 N		CLIENT PROJE EAL. OI TURNA	CLIENT CONTACT (print)/ PROJECT I.D	1040 (J	Dice AFE
Sampler Name:		ļ								!	.expedi	ed lurnarour	*expedited turnaround subject to additional fee	
4101. Ca	2	MATRIX	×				ANA	ANALYSIS	1 1	REQUESTED	TED		EAL use only Do not write	only rite
Evergreen Analytical Cooler No. 472 Cooler Received	punais			simetals (e				-	7	9+8MS/	9bRA		in shaded area	i area
Please PRINT	\sim		- I,,146d/	24 2 (ircle)	03/809/			(Gasoline)	AAOON /	(MOIÐQ SI		EAL	2/
all information:	~			954/2	0808 (c) SZC	0808 \0218	u) P 110	,000i	Ma-e	Plau	105	Custodian	
CLIENT SAMPLE DATE IDENTIFICATION SAMPLED TIME	Mo. of Cont Water-Unni	bilo2 \ lio2	Oil / Sludge TCLP VOA (circle)	10070	pesticides (Herbicides	PCB Screen	11:0	TEPH 8015	(CIRCID P.	7 301	721017	EAL Sample No.	e No.
24Mp-7(2-4) 3-10-15/0915	16	×					×	×	×	ð	メメ	-	X04/63	
34MP-3(2-4) 3-10-15 1400	2	7					×	X	×		×	13	120/	1
24mp-4(3-5) 3+2-45 1600	S	×					×	쏘	X		×		(9)	. :
24mp-9 (q-11) 3-10-91 (too	ررا	×					¥	لا	Y		メ		90)	0
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210 3-11-65 (27)	S	X	=				×	×	×		X		(0)	ا ا
14mo-6 (9-11) 3-11-95 1030		X					×	×	×		R		59	-
175MP-1 (3-5) 3-11-45 1415	N	X					Xm X	X Z	شر ک ر		X E	· ·	\$(1	0
Enside Blade 3-11-97 140	X ~						×	ron				-		_
Inp Blank								٦. ا						2
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2.00			=		_	_		_	_		ļ		Sei O societado	

Date True

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s)/Magnysythundar

Evergreen Analytical Sample Receipt	
Date & Time Rec'd: 3/14/95 10:00 Shipped	1 Via: Frdex 95218260:
Client: RISONS.ES	(Airbill # if applicable)
Client Project ID(s): 722450 21020 MaC	DINAFB
EAL Project #(s):95-0319 EAI	Cooler(s): Y N
Cooler# <u>1/32</u>	
Ice packs (Y) N Y N Y N	Y N Y N
Temperature °C	
	Y N N/A
 Custody seal(s) present: Seals on cooler intact Seals on bottle intact 	
2. Chain of Custody present:	<u>_</u>
3. Containers broken or leaking: (Comment on COC if Y)	
4. Containers labeled:	
5. COC agrees w/ bottles received: (Comment on COC if N)	
6. COC agrees w/ labels: (Comment on COC if N)	
Headspace in VOA vials-waters only (comment on COC if Y)	
3. VOA samples preserved:	
 pH measured on metals, cyanide or phenolic List discrepancies *Non-EAL provided containers only, water 	
0. Metal samples present:	
Total, Dissolved	
D or PD to be filtered: T,TR,D,PD to be Preserved:	
.1. Short holding times: Specify parameters	
12. Multi-phase sample(s) present:	
13. COC signed w/ date/time:	
Comments:	
Additional comments on back) Custodian Signature/Date:	3/14/5

CHAIN OF CUSTODY RECORD / ANALYTICAL SERVICES REQUEST

COMPANY (COSCAS ES	A 4036 Youngfield St.	4036 Youngfield St.		Page of t
	(303) FAX ((900)	Wheat Range, Colorado 80033 (303) 425-6021 FAX (303) 425 6854 (800) 845-7400	CLIENT CONTACT (print)	O ZIUZU /NACOLLE AFA
Sampler Name:	FAX	FAX RESULTS Y / N	TURNAROUND REQUIRED: *expedited turnaround subject to additional fee	it to additional fee
(print) Ky (e. Caringin		ANALYSIS REQUESTED	ESTED	EAL use only Do not write
Evergreen Analytical Cooler No. 422		(cucle)	978	in shaded area
ase PRINT	74.2 (circle) rcle) 98 (circle)	CIE)/MTBE	z pelow) OM / 2M a pelow)	EAU
Siners	9/080\e 9/080\e 9/080\e 9/080\e	Oil & G	ielam metal	Project #
CLIENT SAMPLE DATE DENTIFICATION SAMPLED TIME OF CONTROL SOLID	vok 8260/g WAA 8260/g Pesticides 6 Pesticides 6 Pesticides 6	BTEX 8020//	Science & list	
1-		×	X	Lot Salipie No.
34MP-3(2-4) 3-10-155 1400 5 K		×××××××××××××××××××××××××××××××××××××××	×	
24mp-9(3-5) 3-2-45 1600 5 X		X X	X	
X X 2-10-51- (1-5) 5-10-41-		ソソ	У	
24m2-10 (3-4) 3-11-15 0100 5 x		ン ソ ス	X	
HMW-6 (27) 3-11-95 0130 5 X		×	X	
1 X S 13-45 1330 X		×	×	
15MP-1 (3-5) 3-11-95 1715 5 X		× ×	x	
1 × 1 × 1 × 1 × 1 × 1 ×		×	7	
				Location
DD:				Container Size

3...

Date Time Received by (Signification

Date/Time , Landarshed by (Signature)

Hune) | Date/Time (Received by (Signature)

The Standary

BTEX Data Report

		Client Project No. :	722450.21020
Client Sample Number	: 175MP-1(3-5)		MacDill
Lab Sample Number	: X04170	Lab Project No. :	95-0819
Date Sampled	: 3/11/95	Dílution Factor :	1.00
Date Received	: 3/14/95	Method :	8020
Date Extracted/Prepared	: 3/16/95	Matrix :	Soil
Date Analyzed	: 3/17/95	Lab File No. :	BX2031627
Methanol Extract?	: No	Method Blank No. :	MB031695

		Sample	
Compound Name	Cas Number	Concentration*	PQL*
		ug/kg	ug/kg_
Benzene	71-43-2	U	4.7
Toluene	108-88-3	U	4.7
Ethyl Benzene	100-41-4	U	4.7
Total Xylene	1330-20-7	υ	4.7
Chlorobenzene	108-90-7	U	4.7
1,3,5-trimethylbenzene	108-67-8	U	4.7
1,2,4-trimethylbenzene	95-63-6	υ	4.7
1,2,3-trimethylbenzene	526-73-8	U	4.7
1,2,3,4-tetramethylbenzene	488-23-3	U	4.7

Note: Total Xylene consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

* = Sample reported on a dry weight basis.

Surrogate Recovery:

a,a,a,-Trifluorotoluene : 73% QC Reporting Limits : 64%-130%

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

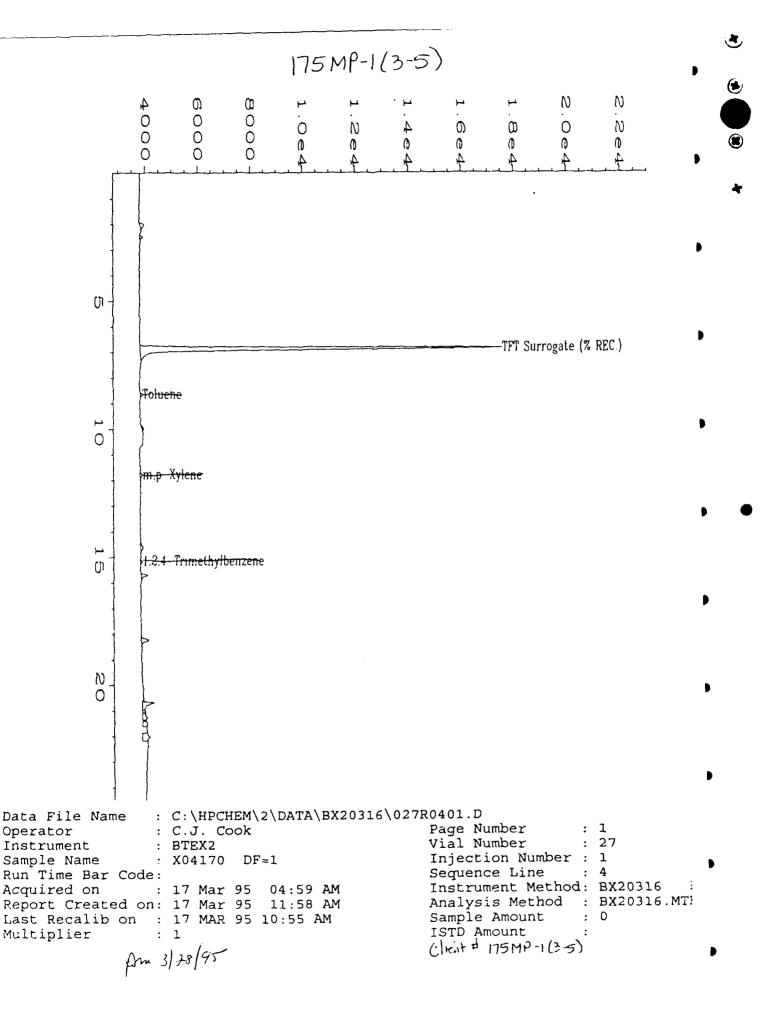
B = Compound found in blank and sample. Compare blank and sample data.

J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 18, Part II, pa. 8000-14.

NA = Not available.

Analyst



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BTEX Data Report

		Client Project No.	: 722450.21020
Client Sample Number	: 175MP-1(3-5)		MacDill
Lab Sample Number	: X04170DUP	Lab Project No.	: 95-0819
Date Sampled	: 3/11/95	Dilution Factor	: 1.00
Date Received	: 3/14/95	Method	: 8020
Date Extracted/Prepared	: 3/16/95	Matrix	: Soil
Date Analyzed	: 3/17/95	Lab File No.	: BX2031628
Methanol Extract?	: No	Method Blank No.	: MB031695

		Sample	
Compound Name	Cas Number	Concentration*	PQL*
		ug/kg	ug/kg
Benzene	71-43-2	U	4.7
Toluene	108-88-3	U	4.7
Ethyl Benzene	100-41-4	U	4.7
Total Xylene	1330-20-7	U	4.7
Chlorobenzene	108-90-7	U	4.7
1,3,5-trimethylbenzene	108-67-8	U	4.7
1,2,4-trimethylbenzene	95-63-6	U	4.7
1,2,3-trimethylbenzene	526-73-8	U	4.7
1,2,3,4-tetramethylbenzene	488-23-3	U	4.7

Note: Total Xylene consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

* = Sample reported on a dry weight basis.

Surrogate Recovery:

a,a,a,-Trifluorotoluene

72%

QC Reporting Limits

: 64%-130%

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

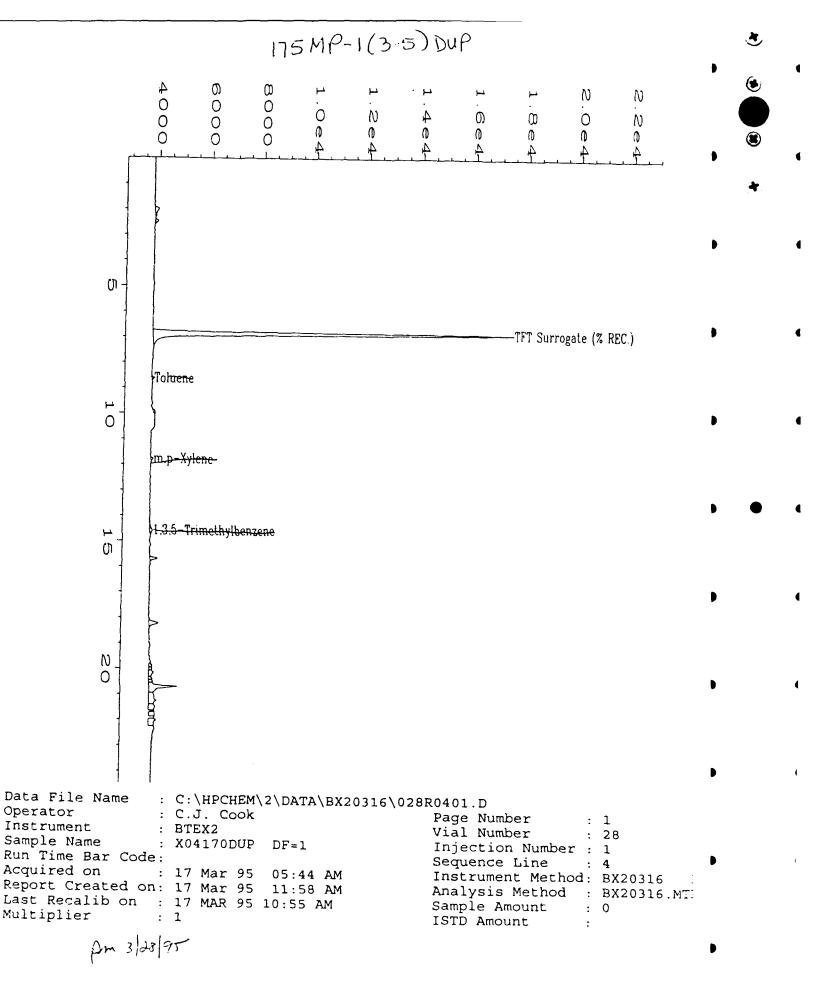
B = Compound found in blank and sample. Compare blank and sample data.

J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available.

Analyst



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Evergreen Analytical, Inc. 4036 Youngfield, Wheat Ridge, CO 80033 (303) 425-6021

TOTAL EXTRACTABLE HYDROCARBONS TEH Matrix Spike/Matrix Spike Duplicate Data Report

Client Sample No.

: 24MP-7(2-4)

Client Project No.

: 722450.21020/MAC DI

Lab Sample No.

: X04163

Lab Project No. EPA Method No. : 95-0819

Date Sampled

: 3/10/95

: 3500/MOD.8015 : SOIL

Date Received Date Prepared : 3/14/95 : 3/17/95

Matrix Method Blank

: SB031795

Date Analyzed

: 3/18/95

	Spike	Sample	MS		QC
Compound	Added	Concentration	Concentration	MS	Limits
	(ug/mL)	(ug/mL)	(ug/L)	%REC	%REC
Jet Fuel	1000	0	910	91	60-140

	Spike	MSD	***			JC .
Compound	Added	Concentration	MS	RPD	Lit	mits
	(ug/mL)	(ug/mL)	%REC		RPD	%REC
Jet Fuel	1000	930	93	2.2	50	60-140

* = Values	outside of	QC limits.
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RPD:

out of (1) outside limits.

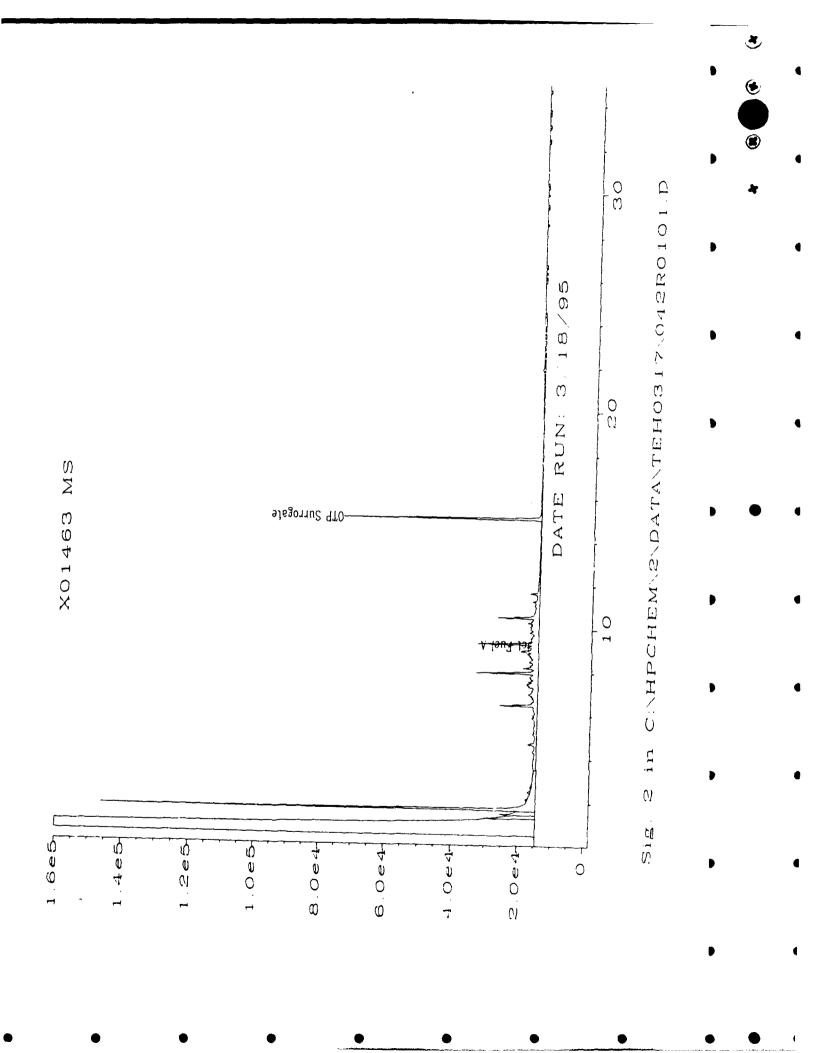
Spike Recovery:

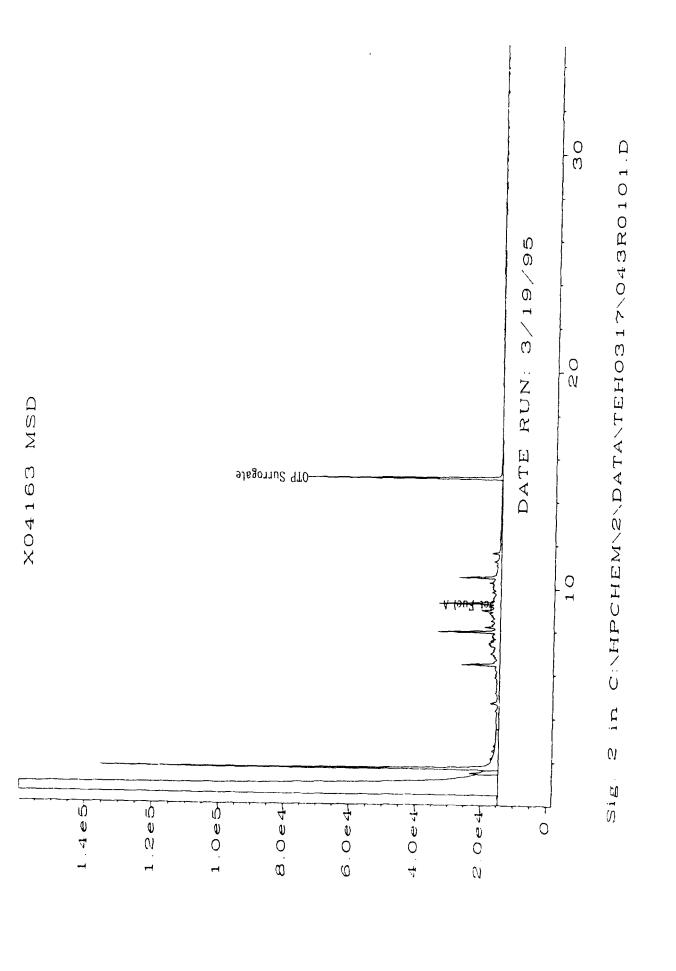
0 out of (1) outside limits.

Comments:

NA = Not analyzed/not applicable.

Values reported in ug/mL in the liquid extract.





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Evergreen Analytical, Inc. 4036 Youngfield, Wheat Ridge, CO 80033 (303) 425-6021



Client Sample No.

: 24MP-7(2-4)

Client Project No.

: 722450.21020/Mac [

Limits

Lab Sample No.

: X04163

Lab Project No.

: 95-0819

Date Sampled

: 3/10/95-3/11/95

EPA Method No.

Concentration

: 5030/8015 Mod

Date Received

: 3/14/95: 3/15/95

Spike

Added

Matrix Method Blank : Soil : MB031595

Date Prepared Date Analyzed

Compound

: 3/15/95-3/16/95

Sample

Concentration

MS	QC

	Spike	MSD		1		ac
Compound	Added	Concentration	MS	RPD	Li	mits
	(mg/L)	(mg/L)	%REC	}	RPD	%REC_
Gasoline	5.00	4.97	99	7.0	30	60-140

*		Values	outside	Ωf	00	limite
	==	values	outside	α	111.	mmuts.

RPD:

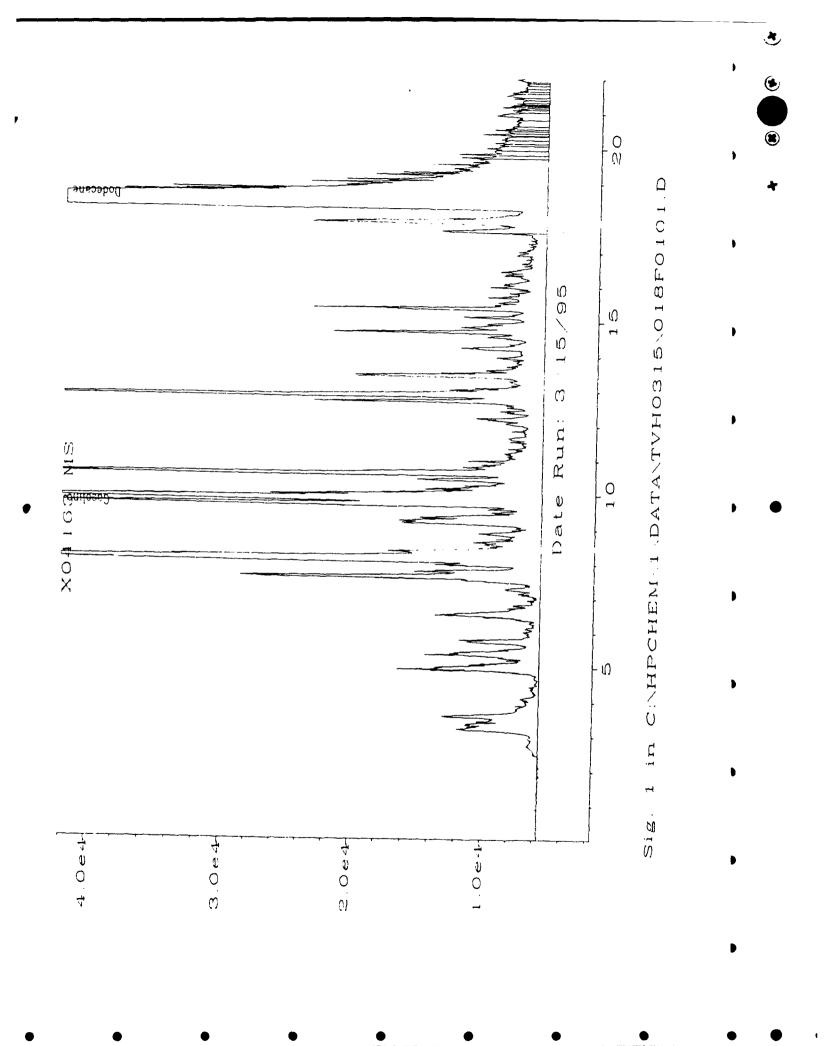
0 out of (1) outside limits.

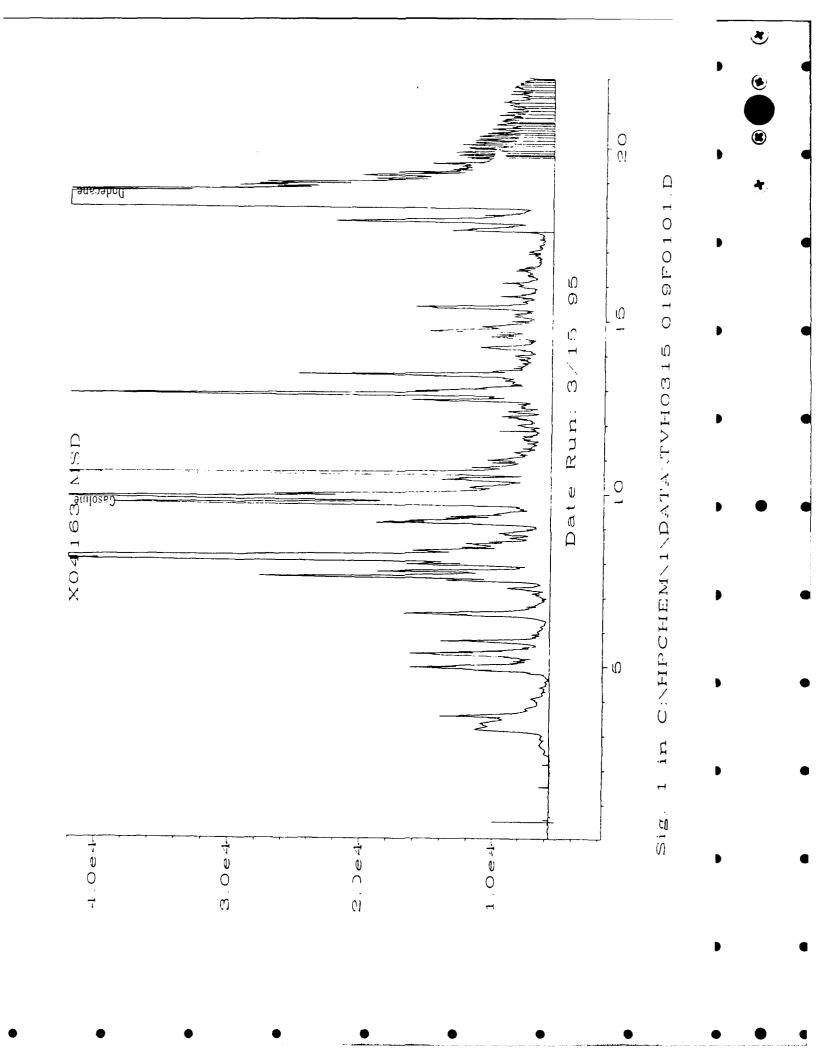
Spike Recovery:

0 out of (2) outside limits.

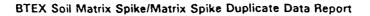
Comments:

NA = Not analyzed/not applicable.





Evergreen Analytical, Inc. 4036 Youngfield, Wheat Ridge, CO 80033 (303) 425-6021



Client Project No.

: 722450.21020

MacDill

Client Sample No.

: 24MP-7(2-4)

Lab Project No.

: 95-0819

Date Sampled
Date Received

: X04163 : 3/10/95

EPA Method No.

: 8020 : Soil

Date Prepared

: 3/14/95 : 3/16/95 Matrix
Lab File Number(s)

: BX2031615

Date Analyzed

: 3/16/95

Method Blank

: MB031695

	Spike	Sample	MS		QC
Compound	Added	Concentration	Concentration	MS	Limits
	_ (ug/L)	(ug/L)	(ug/L)	%REC	%REC
Benzene	20	0.0	18.4	92	65-121
Toluene	20	0.0	18.7	94	69-117
Ethyl Benzene	20	0.0	18.8	94	68-118
m/p-Xylene	40	0.0	41.3	103	66-116
o-Xylene	20	0.0	18.8	94	73-117
Chlorobenzene	20	0.0	18.2	91	65-121
1,3,5-TMB	20	0.0	18.9	95	65-121
1,2,4-TMB	40	0.0	36.3	91	65-121
1,2,3-TMB	40	0.0	33.4	84	65-121
1,2,3,4-TeMB	20	0.0	17.3	87	65-121

	Spike	MSD	T		(DC .
Compound	Added	Concentration	MS	RPD	Lir	nits
	(ug/L)	(ug/L)	%REC		RPD	%REC
Benzene	20	17.7	89	3.9	17.4	65-121
Toluene	20	18.0	90	3.8	15.8	69-117
Ethyl Benzene	20	18.2	91	3.2	11.9	68-118
m/p-Xylene	40	39.8	100	3.7	15.4	66-116
o-Xylene	20	17.9	90	4.9	13.2	73-117
Chlorobenzene	20	17.5	88	3.9	17.4	65-121
1,3,5-TMB	20	18.1	91	4.3	17.4	65-121
1,2,4-TMB	40	33.9	85	6.8	17.4	65-121
1,2,3-TMB	40	32.8	82	1.8	17.4	65-121
1,2,3,4-TeMB	20	15.4	77	12	17.4	65-121

" =	Values	outside	of QC	limits.
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RPD:

____ 0 ___ out of (10) outside limits.

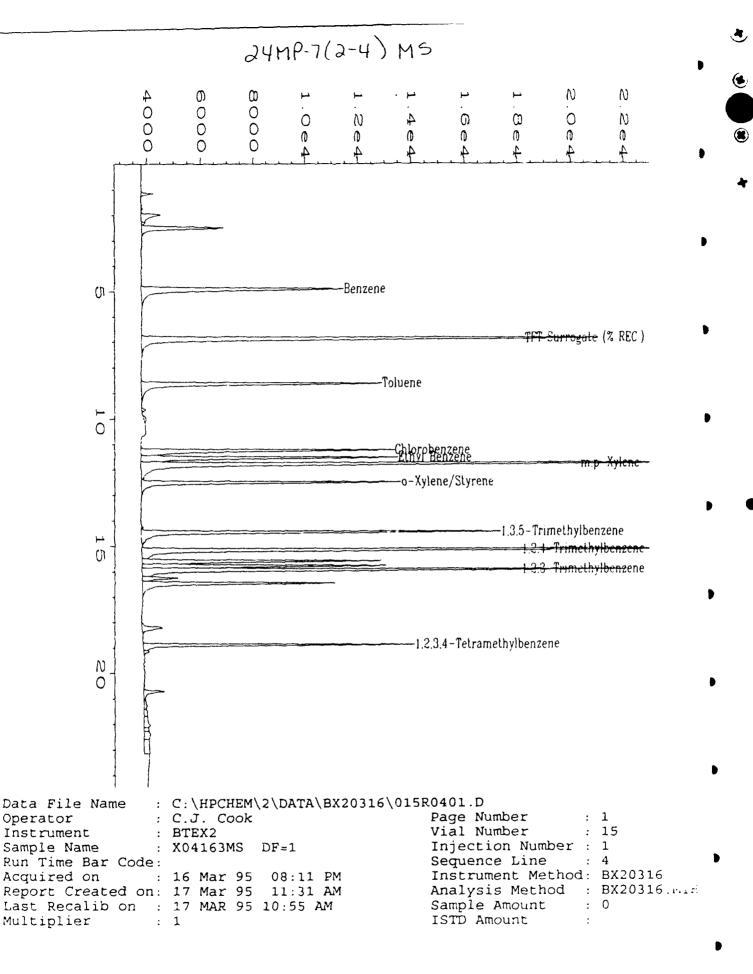
Spike Recovery:

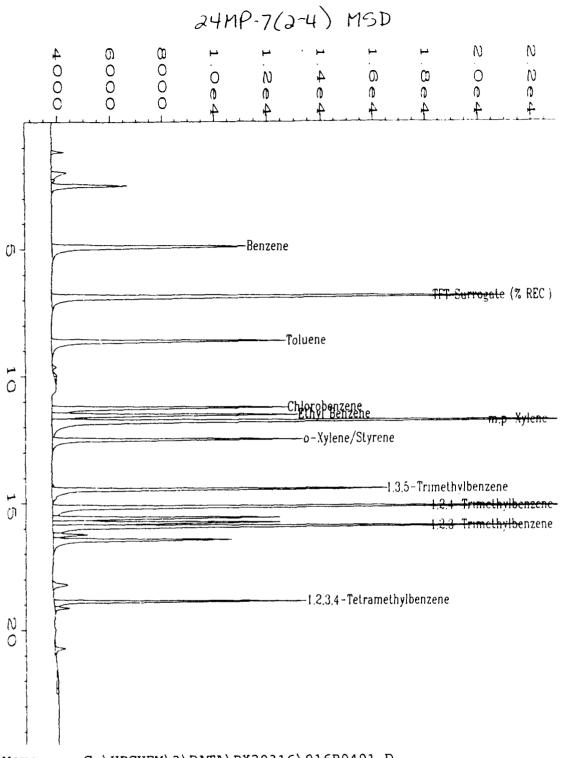
0 out of (20) outside limits.

Comments:

CJC

1770





: C:\HPCHEM\2\DATA\BX20316\016R0401.D Data File Name Page Number Operator : C.J. Cook : 16 Vial Number : BTEX2 Instrument Injection Number: 1 Sample Name : X04163MSD DF=1: 4 Sequence Line Run Time Bar Code: Instrument Method: BX20316.MTH 08:54 PM F wired on : 16 Mar 95 Analysis Method : BX20316.MTH ort Created on: 17 Mar 95 11:32 AM Sample Amount : 0 Last Recalib on : 17 MAR 95 10:55 AM ISTD Amount Multiplier

BTEX Data Report

Client Sample Number	: Rinsate Blank	Client Project No.	: 722450.21020 MacDill
Lab Sample Number	: X04171	Lab Project No.	: 95-0819
Date Sampled	: 3/11/95	Dilution Factor	: 1.00
Date Received	: 3/14/95	Method	: 8020
Date Extracted/Prepared	: 3/16/95	Matrix	: Water
Date Analyzed	: 3/16/95	Lab File No.	: BX2031620
Methanol Extract?	: No	Method Blank No.	: MB031695

Compound Name	Cas Number	Sample Concentration	POL	
Benzene	71-43-2	ug/L U	ug/L	
Denzene	71-43-2	O .	4	
Toluene	108-88-3	U	4	
Ethyl Benzene	100-41-4		4	
Ethyl Denzene	100-41-4	U	4	
Total Xylene	1330-20-7	U	4	
Chlorobenzene	108-90-7	U	4	
Chiorobenzene	106-30-7	U	4	
1,3,5-trimethylbenzene	108-67-8	U	4	
1,2,4-trimethylbenzene	05 63 6	11	4	
1,2,4-timethylbenzene	95-63-6	U	4	
1,2,3-trimethylbenzene	526-73-8	U	4	
1 2 2 4 444	400.22.0		_	
1,2,3,4-tetramethylbenzene	488-23-3	U	4	

Note: Total Xylene consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

Surrogate Recovery:

a,a,a,-Trifluorotoluene

75%

QC Reporting Limits

: 70%-131%

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

B = Compound found in blank and sample. Compare blank and sample data.

J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 18, Part II, pa. 8000-14.

NA = Not available.

Applyar

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Rinsate Blank
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                                                                -TFT Surrogale (% REC.)
                 Toluene
           0
                 <del>lm.p Xylen</del>e
                 1.3.5-Trimethylbenzene RT THE KIND
           O
                  1.2.3.4-Telramethylhenzene
           N
           0
Data File Name : C:\HPCHEM\2\DATA\BX20316\020R0401.D
                                                      Page Number
                  : C.J. Cook
                                                      Vial Number
                                                                          : 20
Instrument
                   : BTEX2
                                                      Injection Number: 1
                  : X04171 DF=1
Sample Name
                                                      Sequence Line
                                                                         : 4
Run Time Bar Code:
                                                      Instrument Method: BX20316.MTH
               ·: 16 Mar 95
                                  11:50 PM
 uired on
                                                      Analysis Method : BX20316.MTH
   ort Created on: 17 Mar 95 11:33 AM
Last Recalib on : 17 MAR 95 10:55 AM
                                                      Sample Amount
```

ISTD Amount

pm 3/28/95

: 1

Operator

Multiplier

BTEX Data Report

Client Sample Number	: Trip Blank	Client Project No.	: 722450.21020 MacDill
Lab Sample Number	: X04172	Lab Project No.	: 95-0819
Date Sampled	: 3/11/95	Dilution Factor	: 1.00
Date Received	: 3/14/95	Method	: 8020
Date Extracted/Prepared	: 3/16/95	Matrix	: Water
Date Analyzed	: 3/17/95	Lab File No.	: BX2031621
Methanol Extract?	: No	Method Blank No.	: MB031695

Compound Name	Sample		
	Cas Number	Concentration ug/L	PQL ug/L
Toluene	108-88-3	υ	4
Ethyl Benzene	100-41-4	U	4
Total Xylene	1330-20-7	U	4
Chlorobenzene	108-90-7	υ	4
1,3,5-trimethylbenzene	108-67-8	U	4
1,2,4-trimethylbenzene	95-63-6	U	4
1,2,3-trimethylbenzene	526-73-8	U	4
1,2,3,4-tetramethylbenzene	488-23-3	. U	4

Note: Total Xylene consist of three isomers, two of which co-elute.

The Xylene I 2L is for a single peak.

Surrogate Recovery:

a,a,a,-Trifluorotoluene

74%

QC Reporting Limits

: 70%-131%

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

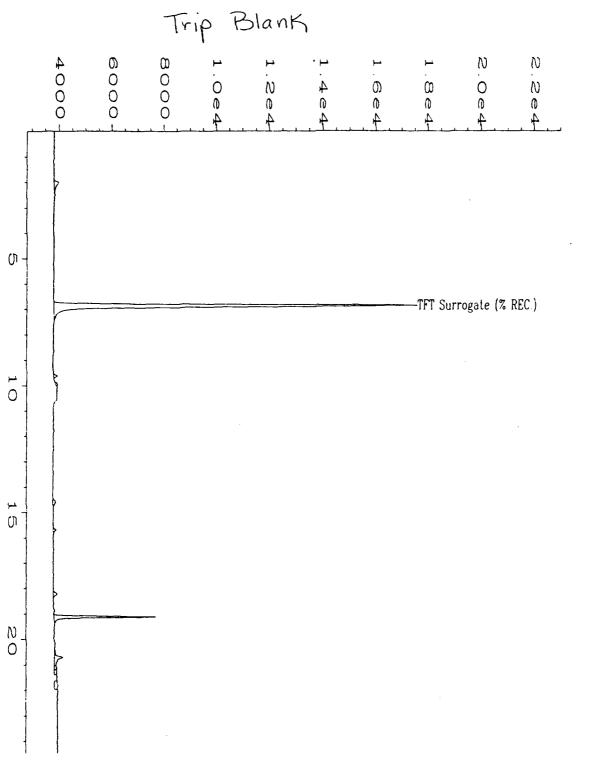
B = Compound found in blank and sample. Compare blank and sample data.

J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available.

Analyst



Data File Name : C:\HPCHEM\2\DATA\BX20316\021R0401.D : C.J. Cook Page Number Operator Vial Number Instrument : BTEX2 Injection Number: 1 Sample Name : X04172 DF=1 Run Time Bar Code: Sequence Line : 4 Instrument Method: BX20316.MTH lired on : 17 Mar 95 00:35 AM k port Created on: 17 Mar 95 11:34 AM Analysis Method : BX20316.MTH Sample Amount : 0 Last Recalib on : 17 MAR 95 10:55 AM ISTD Amount Multiplier

BTEX Data Report Method Blank Report

Method Blank Number : MB031695 Client Project No.

: 722450.21020

Lab Project No.

MacDill : 95-0819

Date Extracted/Prepared Date Analyzed

: 3/16/95

: 1.00

: 3/16/95

Dilution Factor Method

Matrix

: 8020 : Water

Lab File No.

: BX2031609

Sample	e
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Compound Name	Sample			
	Cas Number	Concentration ug/L	PQL ug/L	
				Benzene
Toluene	108-88-3	U	4	
Ethyl Benzene	100-41-4	U	4	
Total Xylene	1330-20-7	υ	4	
Chlorobenzene	108-90-7	U	4	
1,3,5-trimethylbenzene	108-67-8	U	4	
1,2,4-trimethylbenzene	95-63-6	U	4	
1,2,3-trimethylbenzene	526-73-8	U	4	
1,2,3,4-tetramethylbenzene	488-23-3	U	4	

Note: Total Xylene consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

Surrogate Recovery:

a,a,a,-Trifluorotoluene

97%

QC Reporting Limits

: 70%-131%

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

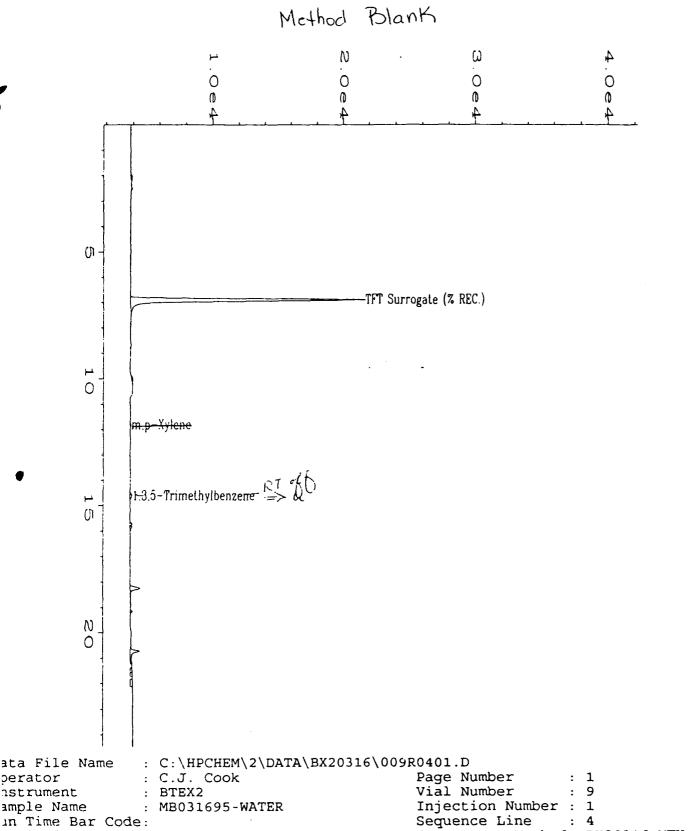
B = Compound found in blank and sample. Compare blank and sample data.

J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available

Analyst



astrument ample Name in Time Bar Code: rt Created on: 17 Mar 95 03:41 PM Instrument Method: BX20316.MTH Analysis Method : BX20316.MTH ist Recalib on : 17 MAR 95 10:55 AM Sample Amount : 0 ultiplier ISTD Amount

.pm 3/28/95

perator

EVERGREEN ANALYTICAL, iNC. 4036 Youngfield St. Wheat Ridge, CO 80033 (303) 425-6021

BTEX Data Report Method Blank Report

Client Project No.

: 722450.21020

MacDill

Method Blank Number Date Extracted/Prepared : MB031795

: 95-0819

Date Analyzed

: 3/17/95 : 3/17/95 Lab Project No.
Dilution Factor

: 1.00

Method

: 8020

Matrix

: 8020 : Water

Lab File No.

: BX2031709

Sample

	Sample								
Compound Name	Cas Number	Concentration	PQL						
•		ug/L	ug/L						
Benzene	71-43-2	U	4						
Toluene	108-88-3	U	4						
Ethyl Benzene	100-41-4	υ	4						
Total Xylene	1330-20-7	U	4						
Chlorobenzene	108-90-7	U	4						
1,3,5-trimethylbenzene	108-67-8	U	4						
1,2,4-trimethylbenzene	95-63-6	U	4						
1,2,3-trimethylbenzene	526-73-8	U	4						
1,2,3,4-tetramethylbenzene	488-23-3	U	4						

Note: Total Xylene consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

Surrogate Recovery:

a,a,a,-Trifluorotoluene

90%

QC Reporting Limits

: 70%-131%

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

B = Compound found in blank and sample. Compare blank and sample data.

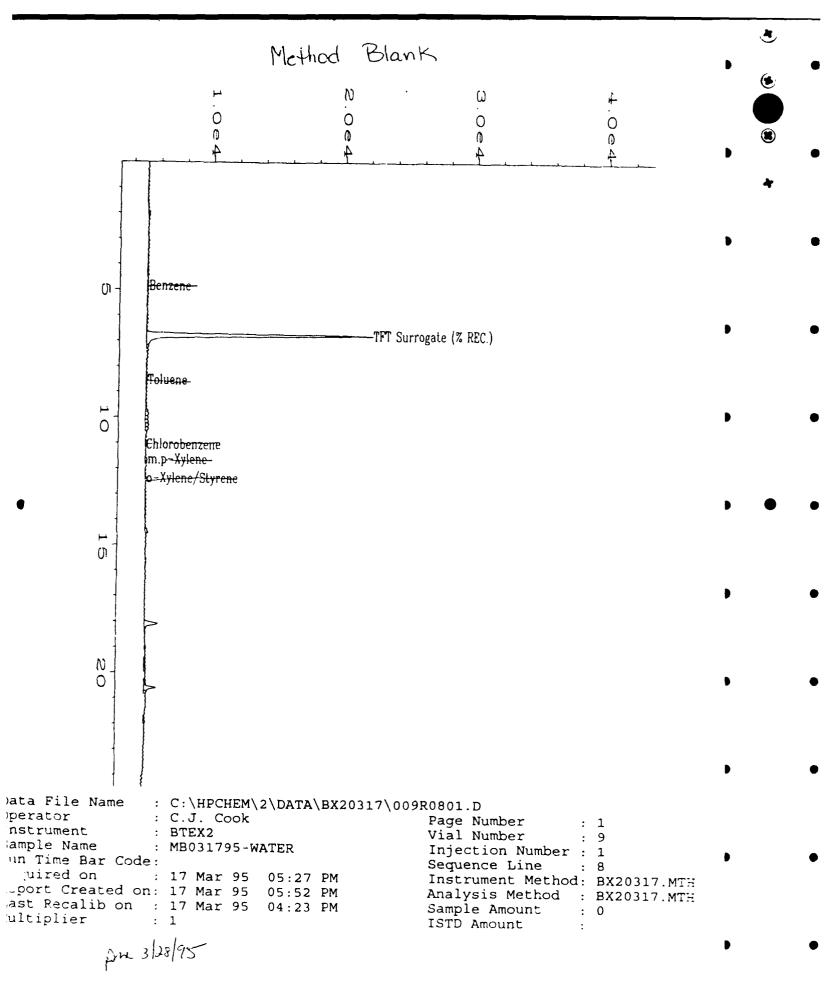
J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 18, Part II, pa. 8000-14.

NA = Not available.

Analyst

Approved



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EVERGREEN ANALYTICAL, INC. 4036 Youngfield St. Wheat Ridge, CO 80033 (303) 425-6021

BTEX Data Report Laboratory Control Sample (LCS)

Client Project No. : 722450.21020

MacDill

12-23

15-25

NA

❖

LCS Number : LCS031795 Date Extracted/Prepared : 3/17/95 Lab Project No. : 95-0819 Dilution Factor Date Analyzed : 3/17/95 : 1.00

Method : 602 Matrix : Water

Lab File No. : BX2031710

	LCS							
Compound Name	Cas Number	Concentration ug/L	QC Limit ug/L					
Benzene	71-43-2	17.3	12-24					
Toluene	108-88-3	16.3	13-22					
Ethyl Benzene	100-41-4	16.0	13-24					
m,p-Xylene	NA	16.2	13-24					
o-Xylene	95-47-6	15.9	13-24					
Chlorobenzene	108-90-7	16.1	14-23					
1,3,5-trimethylbenzene	108-67-8	16.2	12-24					

12.7

14.0

1,2,3,4-tetramethylbenzene 488-23-3 Note: Total Xylene consist of three isomers, two of which co-elute.

95-63-6

526-73-8

The Xylene PQL is for a single peak.

Surrogate Recovery:

1,2,4-trimethylbenzene

1,2,3-trimethylbenzene

a,a,a,-Trifluorotoluene 90% QC Reporting Limits : 69%-131%

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

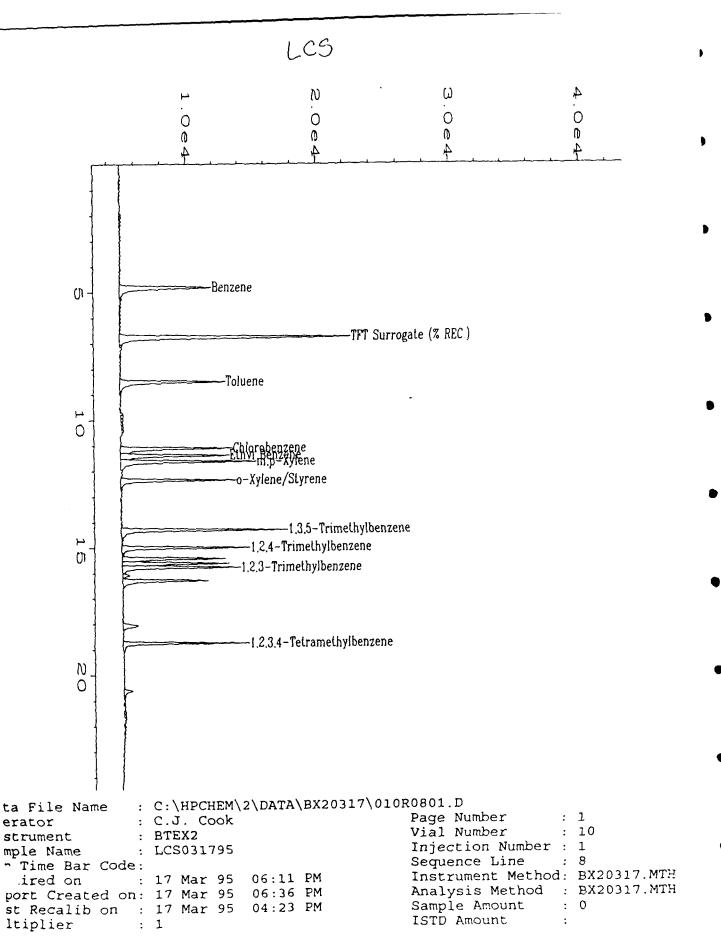
B = Compound found in blank and sample. Compare blank and sample data.

J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available.

Analyst



EVERGREEN ANALYTICAL, INC. 4036 Youngfield St. Wheat Ridge, CO 80033 (303) 425-6021

BTEX Data Report Laboratory Control Sample (LCS)

LCS Number : LCS031695 Client Project No.

: 722450.21020

MacDill : 95-0819

Date Extracted/Prepared Date Analyzed

: 3/16/95 : 3/16/95 Lab Project No. **Dilution Factor**

: 1.00

Method

: 602

Matrix

: Water

Lab File No.

: BX2031610

105

		LCS	
Compound Name	Cas Number	Concentration	QC Limit
·		ug/L	ug/L
Benzene	71-43-2	18.4	12-24
Toluene	108-88-3	17.8	13-22
Ethyl Benzene	100-41-4	18.0	13-24
m,p-Xylene	NA	16.7	13-24
o-Xylene	95-47-6	17.4	13-24
Chlorobenzene	108-90-7	17.9	14-2
1,3,5-trimethylbenzene	108-67-8	18.8	12-24
1,2,4-trimethylbenzene	95-63-6	14.2	12-23
1,2,3-trimethylbenzene	526-73-8	16.2	15-25
1,2,3,4-tetramethylbenzene	488-23-3	17.8	NA

Note: Total Xylene consist of three isomers, two of which co-elute.

The Xylene PQL is for a single peak.

Surrogate Recovery:

a,a,a,-Trifluorotoluene

96%

QC Reporting Limits

: 69%-131%

QUALIFIERS:

E = Extrapolated value

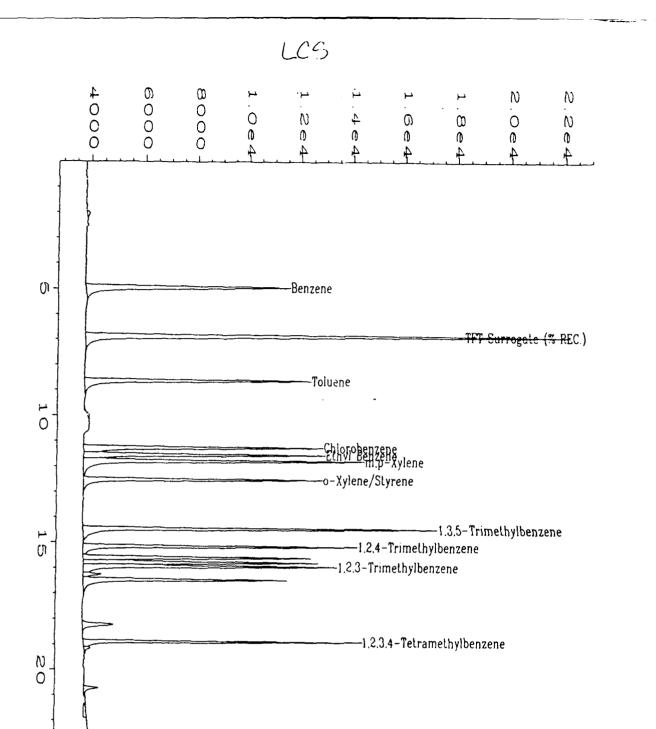
U = Compound analyzed for, but not detected.

B = Compound found in blank and sample. Compare blank and sample data.

J = Indicates an estimated value when the compound is detected, but is below the Practical Quantitation Limit (PQL).

PQL = Practical Quantitation Limit. The PQL is equal to the dilution factor multiplied by ten times the Method Detection Limit as determined by EPA SW846, Vol. 1B, Part II, pa. 8000-14.

NA = Not available.



Data File Name : C:\HPCHEM\2\DATA\BX20316\010R0401.D Operator : C.J. Cook Page Number Instrument BTEX2 Vial Number : 10 Sample Name : LCS031695 Injection Number: 1 Run Time Bar Code: Sequence Line : 4 ired on : 16 Mar 95 04:26 PM Instrument Method: BX20316.MTH Report Created on: 17 Mar 95 11:29 AM Analysis Method : BX20316.MTH Last Recalib on : 17 MAR 95 10:55 AM Sample Amount : 0 Multiplier ISTD Amount





TOTAL VOLATILE HYDROCARBONS (TVH)

Date Sampled Date Received : 3/10/95-3/11/95

Client Project Number

: 722450.21020/Mac Dill

: 3/14/95

Lab Project Number

: 95-0819

Date Prepared

: 3/15/95

Matrix

: Soil

Date Analyzed

: 3/15/95-3/16/95

Method Number

: 5030/Mod.8015

Evergreen Sample #	Client Sample #	Surrogate Recovery	TVH** mg/Kg	MDL** mg/Kg	
MB031595	Method Blank	100%	υ	0.1	1
X04163	24MP-7(2-4)	115%	U	0.12	
X04164	24MP-8(2-4)	116%	U	0.11	
X04165	24MP-9(3-5)	132%	0.17	0.12	
X04166	24MP-9(9-11)	124%	U	0.12	
X04167	24MP-10(2-4)	126%	U	0.12	
X04168	24MW-6(2-4)	127%	U	0.13	
X04169	24MW-6(9-11)	122%	U	0.12	
X04170	175MP-1(3-5)	130%	U	0.12	
X04170 DUP	175MP-1(3-5)	119%	U	0.12	

QUALIFIERS

U = TVH analyzed for but not detected.

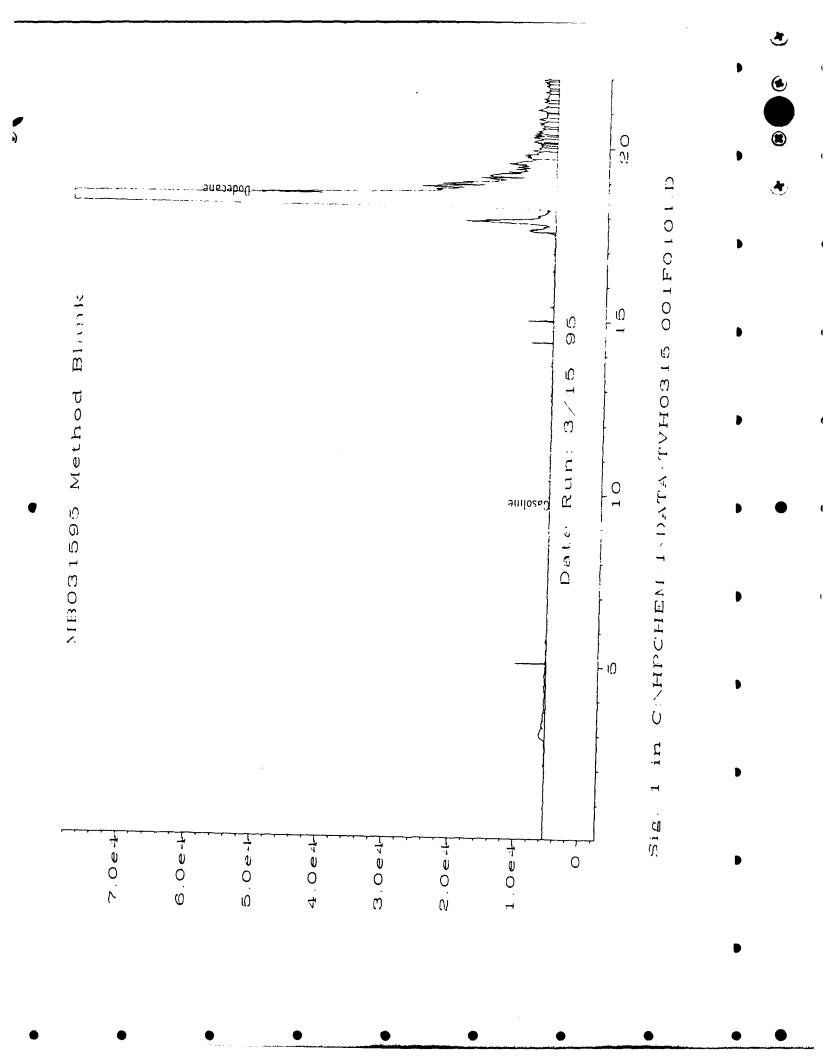
B = TVH found in blank as well as sample (blank data should be compared).

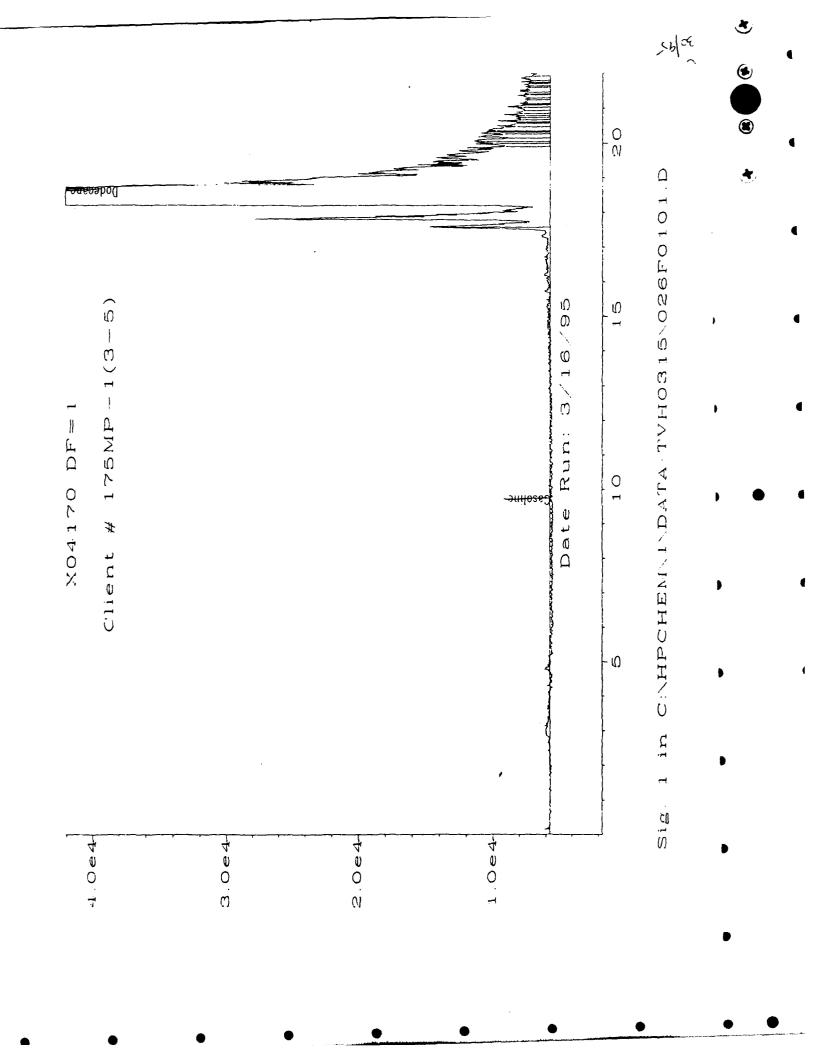
E = Extrapolated value.

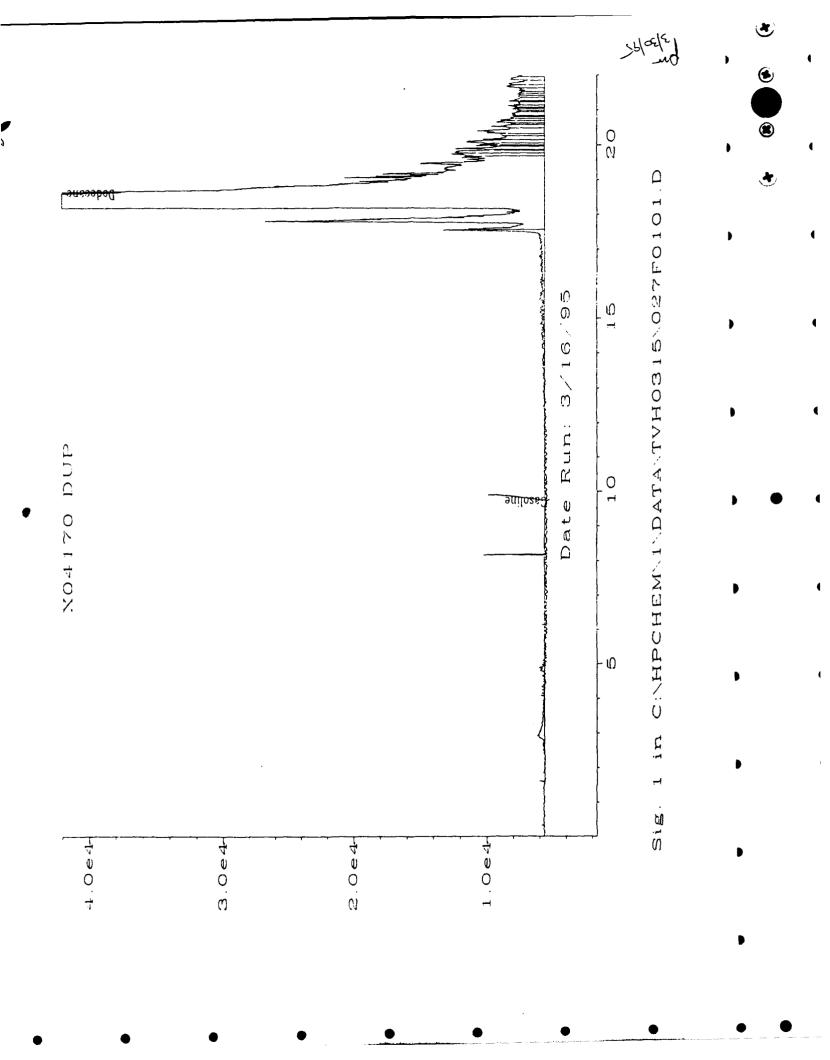
MDL = Method Detection Limit

** = All sample results and MDLs are reported on a dry weight basis.

Analyst







EVERGREEN ANALYTICAL, INC. 4036 Youngfield, Wheat Ridge, CO 80033 (303) 425-6021



Date Sampled

: 3/10/95,3/11/95

Client Project Number

722450.21020/MAC DILL

Date Received

: 3/14/95

Lab Project Number

Date Prepared

: 3/15,17/95

Matrix

: 95-0819 : SOIL

Date Analyzed

: 3/18,19,22/95

Method Number

: 3500/8015M

Evergreen Sample #	Client Sample #	Surrogate Recovery	TEH * mg/Kg	RL* mg/Kg
SB031595	SOIL METHOD BLANK	81%	U	10
SB031795	SOIL METHOD BLANK	77%	U	10
X04163	24MP-7(2-4)	73%	U	12
X04164	24MP-8(2-4)	76%	U	12
X04165	24MP-9(3-5)	77%	U	12
X04166	24MP-9(9-11)	78%	U	12
X04167	24MP-10(2-4)	77%	U	12
X04168	24MW-6(2-4)	84%	U	13
X04169	24MW-6(9-11)	81%	U	12
X04170	175MP-1(3-5)	81%	U	12

QUALIFIERS

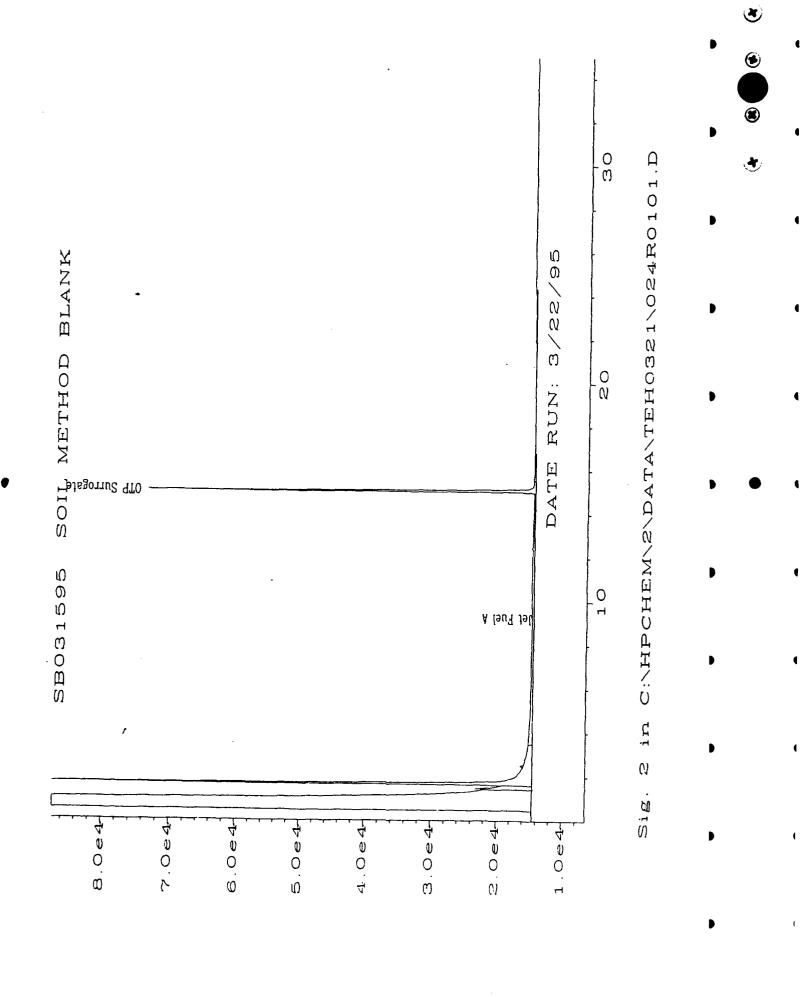
U = TEH analyzed for but not detected.

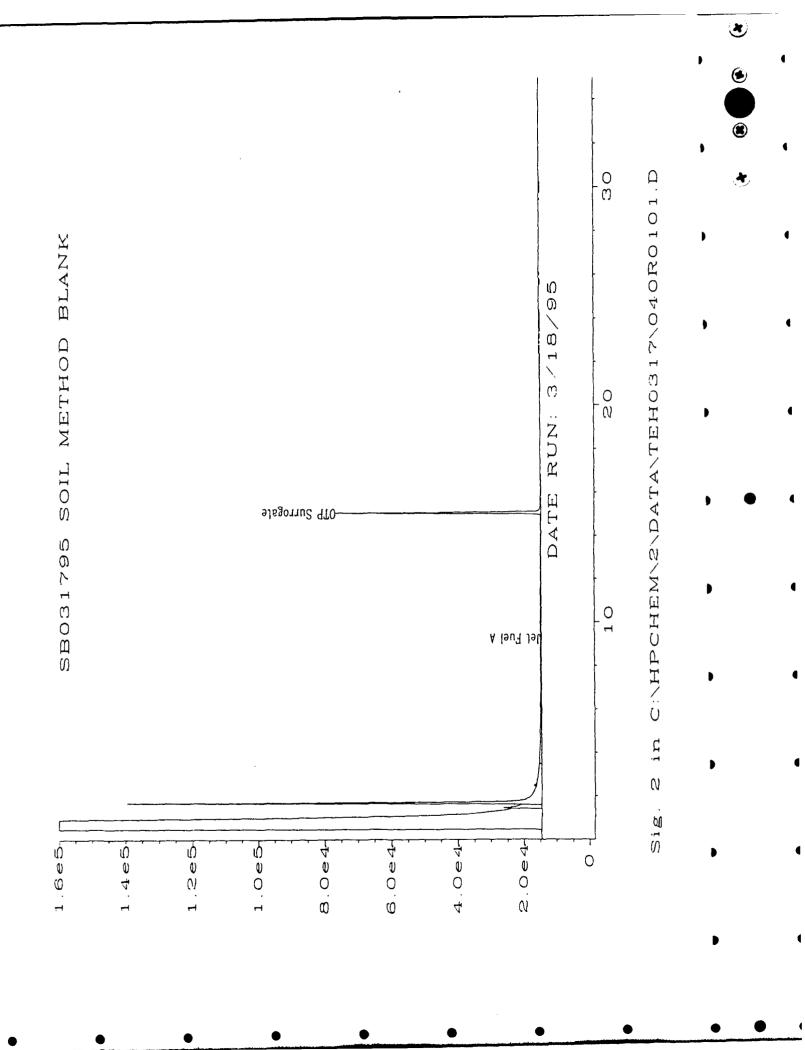
B = TEH found in blank as well as sample (blank data should be compared).

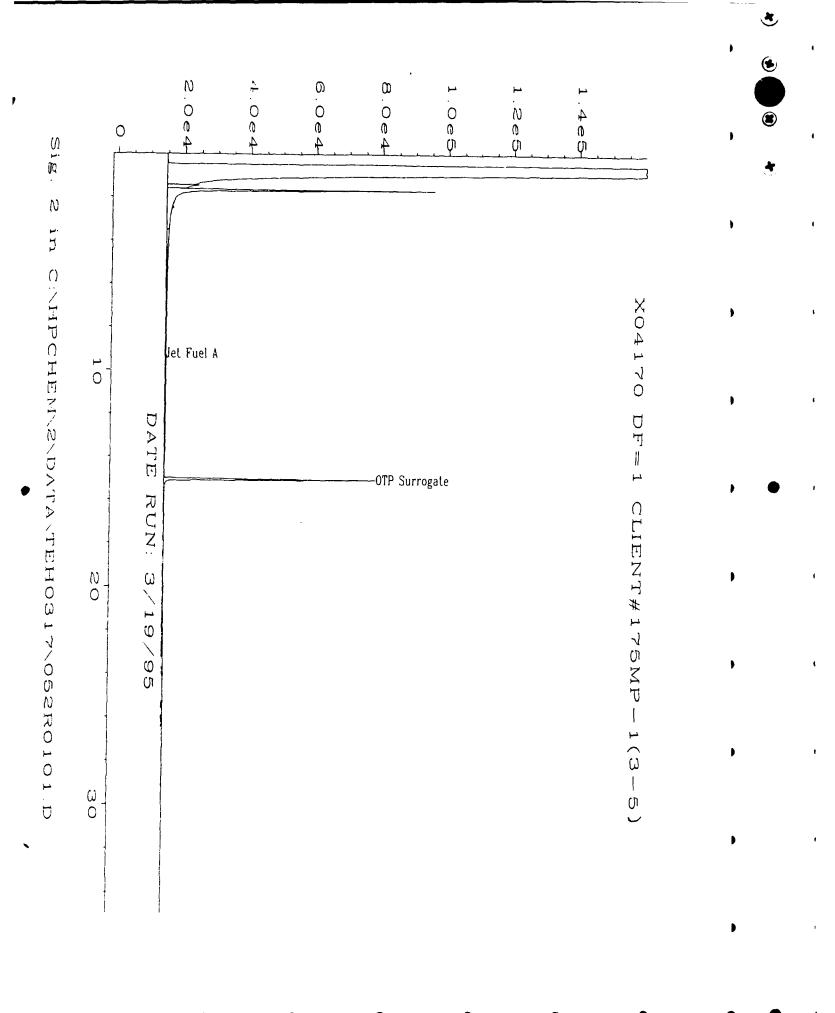
E = Extrapolated value.

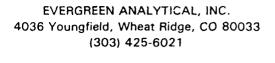
RL = Reporting Limit

* = Based on dry weight









TOTAL EXTRACTABLE HYDROCARBONS (TEH) Laboratory Control Sample (LCS)

LCS Number

: LCS031595

Client Project Number

: 722450.21020/MAC DILL

Date Prepared

: 3/15/95

Lab Project Number

: 95-0819

Date Analyzed

: 3/18/95

Matrix

: SOIL

Sequence Number

: TEH0317021

Method Number

: 3500/Mod. 8015

	LCS					
Compound Name	Theoretical Concentration mg/L	Concentration mg/Kg	QC Limit mg/Kg			
JET FUEL	1000	960	750-1750			

QUALIFIERS

U = TEH analyzed for but not detected.

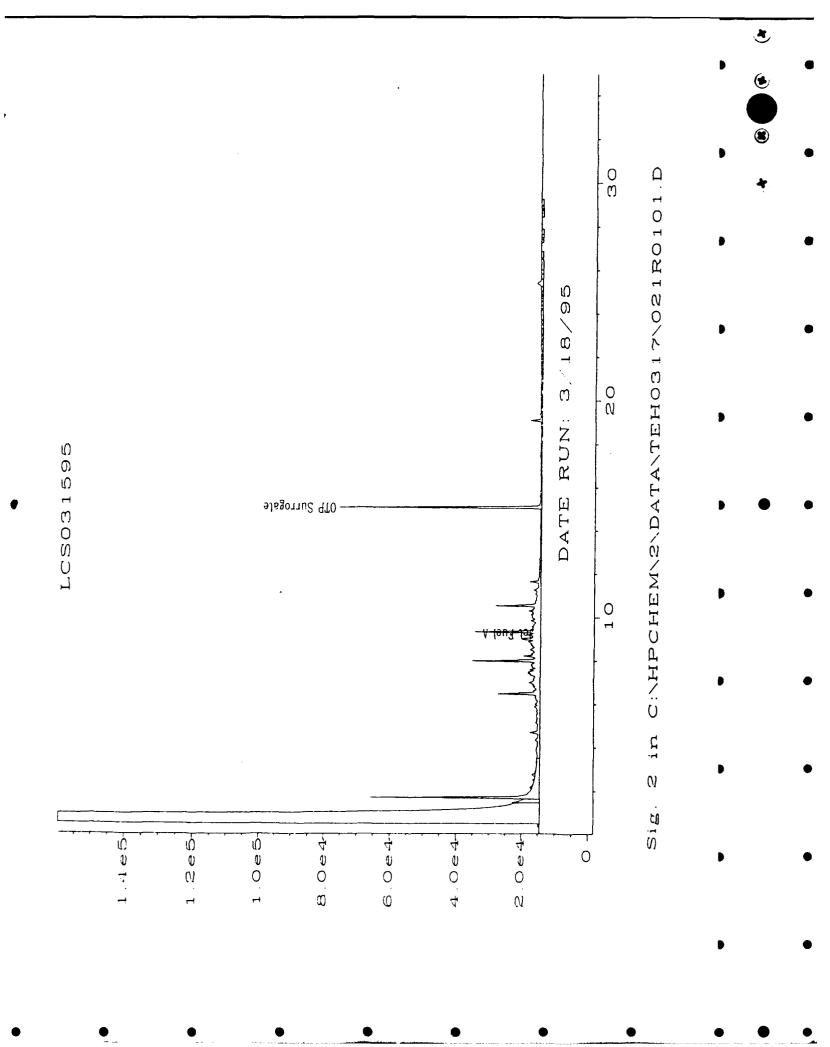
B = TEH found in blank as well as sample (blank data should be compared).

E = Extrapolated value.

NA = Not Available.

Analyst

Approved



EVERGREEN ANALYTICAL, INC. 4036 Youngfield St. Wheat Ridge, CO 80033 (303)425-6021

Miscellaneous Analyses

Date Sampled : 3/10,11/95 Client Project ID. : 722450.21020 Date Received: 3/14/95 Lab Project No. : 95-0819

Date Prepared: 3/15/95 Date Analyzed: 3/15/95 Matrix : Soil

Method : EPA 160.3

Evergreen <u>Sample</u> #	Client <u>Sample ID</u>	Moisture (%)	•
X04163	24MP-7 (2-4)	17.2	
X04164	24MP-8 (2-4)	18.7	b
X04165	24MP-9 (3-5)	18.6	
X04166	24MP-9 (9-11)	18.3	
X04167	24MP-10 (2-4)	16.7	Þ
X04168	24MW-6 (2-4)	20.8	
X04169	24MW-6 (9-11)	18.0	
X04170	175MP-1 (3-5)	14.4	•

Analyst

Approved

0819tm.4



Quality Analytical Services Since 1936 4630 Indiana Street • Colden, CO 80403

NON-CLP ANALYSIS RESULTS

Date:

Sample Matrix:

03/24/95

Lab Name: Contact: Huffman Labs

Sue Zeller

Client: Evergreen Analytical Contact: Patty McClellan

soil

Huffman Lab #: 143595

Instrument	Method	Sample	Analysis	Prep	Units	Results	Dilution	Element/	Lab	Client	
ID	#	Size (g)	Date	Date			Factor	Compound	ID#	Smp#	
#7	Leco CR12	2.195	03/23/95	NA	%	< 0.05	NA	TC	14359501	7555-4 (3-4)	
#7	Leco CR12	2.067	03/23/95	NA	%	< 0.05	NA	TC	14359501	75SS-4 (3-4)	
#7	Leco CR12	2.154	03/23/95	NA	%	< 0.05	NA	TC	14359502	75SS-6 (3-5)	
#7	Leco CR12	3.332	^3/23/95	NA	%	< 0.05	NA	TC	14359503	75MP-7 (4-6)	
#7	Leco CR12	2.888	03/23/95	NA	%	< 0.05	NA	TC	14359504	75MP-17 (4-6)	
#7	Leco CR12	3.555	03/23/95	NA	%	< 0.05	NA	TC	14359505	24MP-7 (2-4)	
#7	Leco CR12	3.331	03/23/95	NA	%	0.21	NA	TC	14359506	24MP-3 (3-5)	
#7	Leco CR12	2.908	03/23/95	NA	%	0.13	NA	TC	14359507	24MP-4 (3-5)	
#7	Leco CR12	3.093	03/23/95	NA	%	2.21	NA	TC	14359508	24MP-8 (4-6)	
#7	Leco CR12	3.394	03/23/95	NA	%	0.73	NA	TC	14359509	24MP-16 (4-6)	
"tower"	C0U-02	0.111	03/21/95	NA	%	< 0.02	NA	CC	14359501	75SS-4 (3-4)	
"tower"	COU-02	0.259	03/21/95	NA	%	< 0.02	NA	CC	14359501	75SS-4 (3-4)	
"tower"	COU-02	0.185	03/21/95	NA	%	< 0.02	NA	CC	14359502	75SS-6 (3-5)	
"tower"	COU-02	0.248	03/21/95	NA	%	< 0.02	NA	CC	14359503		
"tower"	COU-02	0.221	03/21/95	NA	%	< 0.02	NA	CC	14359504	75MP-17 (4-6)	
"tower"	COU-02	0.127	03/21/95	NA	%	< 0.02	NA	CC	14359505		
"tower"	COU-02	0.130	03/21/95	NA	%	< 0.02	NA	CC	14359506	24MP-3 (3-5)	
"tower"	COU-02	0.128	03/21/95	NA	%	< 0.02	NA	cc	14359507	24MP-4 (3-5)	
"tower"	COU-02	0.138	03/21/95	NA	%	< 0.02	NA	cc	14359508		
"tower"	CON-03	0.165	03/21/95	NA	% الس	<0.02	NA	loisture CC	14359509	24MP-16 (4-6)	
NA	by calc	NA	NA	NA	%	< 0.05	NA	тос	14359501	75SS-4 (3-4)	
NA	by calc	NA	NA	NA	%	< 0.05	NA	TOC	14359501	75SS-4 (3-4)	
NA	by calc	NA	NA	NA	%	< 0.05	NA	TOC	14359502	7555-6 (3-5)	0871
NA	by calc	NA	NA	NA	%	< 0.05	NA	TOC	14359503	75MP-7 (4-6)	
NA	by calc	NA_	NA	NA	%%	< 0.05	NA	TOC	14359504	75MP-17 (4-6)	
NA NA	by calc	NA	NA	NA	.06%	< 0.05 0	NA	7.24 TOC	14359505	24MP-7 (2-4)	7819
NA	by calc	NA	NA	NA	%	0.21	NA	TOC	14359506	24MP-3 (3-5)	
NA	by calc	NA	NA	NA	%	0.13	NA	TOC	14359507	24MP-4 (3-5)	1020
NA	by calc	NA	NA	NA	%	2.21	NA	TOC	14359508	24MP-6 (4-6)	2820
NA	by calc	NA	NA	NA	%	0.73	NA	TOC	14359509	24MP-16 (4-6)	

Samples analyzed and results reported on an as received basis.

Soil samples are not homogeneous.

Values reported below Detection Limits are for reference only.

TC detection limit = 0.05% CC detection limit = 0.02%

TOC detection limit = 0.05%

numbers to the left above represent the last four digits of the EAL project mber under which the samples were analyzed.

e original report and quality control results are filed with EAL project 95-0819



Ouality Analytical Services Since 1936 4630 Indiana Street • Golden, CO 80403

NON-CLP ANALYSIS RESULTS

Date:

03/24/95

Lab Name: Contact:

Huffman Labs

Sue Zeller

Client: Evergreen Analytical

Sample Matrix:

soil

Contact: Patty McClellan Huffman Lab #: 143595

Instrumen	Method	Sample	Analysis	Prep	Units	Results	Dilution	Element/	Client Lab
IC	#	Size (g)	Date	Date			Factor	Compound	Smp# ID#
	Leco CR12	2.195	03/23/95	NA	%	< 0.05	NA	TC	7555-4 (3-4) 14359501
# 7	Leco CR12	2.067	03/23/95	NA	%	< 0.05	NA	TC	75\$\$-4 (3-4) 14359501
# 7	Leco CR12	2.154	03/23/95	NA	%	< 0.05	NA	TC	7555-6 (3-5) 14359502
#7	Leco CR12	3.332	03/23/95	NA	%	< 0.05	NA	TC	75MP-7 (4-6) 14359503
#7	Leco CR12	2.888	03/23/95	NA	%	< 0.05	NA	TC	75MP-17 (4-6) 14359504
#7	Leco CR12	3.555	03/23/95	NA	%	< 0.05	NA	TC	24MP-7 (2-4) 14359505
#7	Leco CR12	3.331	03/23/95	NA	%	0.21	NA	TC	24MP-3 (3-5) 14359506
#7	Leco CR12	2.908	03/23/95	NA	%	0.13	NA	TC	24MP-4 (3-5) 14359507
#7	Leco CR12	3.093	03/23/95	NA	%	2.21	NA	TC	24MP-6 (4-6) 14359508
#7	Leco CR12	3.394	03/23/95	NA	%	0.73	NA	TC	24MP-16 (4-6) 14359509
"tower"	COU-02	0.111	03/21/95	NA	%	< 0.02	NA	CC	75SS-4 (3-4) 14359501
"tower"	COU-02	0.259	03/21/95	NA	%	< 0.02	NA	CC	7585-4 (3-4) 14359501
"tower"	COU-02	0.185	03/21/95	NA	%	< 0.02	NA	CC	75SS-6 (3-5) 14359502
"t/ ."	COU-02	0.248	03/21/95	NA	%	< 0.02	NA	CC	75MP-7 (4-6) 14359503
•t ·	COU-02	0.221	03/21/95	NA	%	< 0.02	NA	CC	75MP-17 (4-6) 14359504
"tower"	COU-02	0.127	03/21/95	NA	%	< 0.02	NA	CC	24MP-7 (2-4) 14359505
"tower"	COU-02	0.130	03/21/95	NA	%	< 0.02	NA	CC	24MP-3 (3-5) 14359506
"tower"	COU-OZ	0.128	03/21/95	NA	%	< 0.02	NA	CC	24MP-4 (3-5) 14359507
"tower"	COU-02	0.138	03/21/95	NA	%	< 0.02	NA	CC	24MP-6 (4-6) 14359508
"tower"	COU-02	0.165	03/21/95	NA	%	< 0.02	NA	CC	24MP-18 (4-6) 14359509
NA	by calc	NA	NA	NA	%	< 0.05	NA	TOC	75\$\$-4 (3-4) 14359501
NA	by calc	NA	NA	NA	%	< 0.05	NA	TOC	7555-4 (3-4) 14359501
NA	by calc	NA	NA	NA	%	< 0.05	NA	TOC	7555-6 (3-5) 14359502
NA	by calc	NA	NA	NA	%	< 0.05	NA	TOC	75MP-7 (4-6) 14359503
NA	by calc	NA	NA	NA	%	< 0.05	NA	TOC	75MP-17 (4-6) 14359504
NA.	by calc	NA	NA	NA	%	< 0.05	NA	TOC	24MP-7 (2-4) 14359505
NA.	by calc	NA	NA	NA	%	0.21	NA	TOC	24MP-3 (3-5) 14359506
NA.	by calc	NA	NA	NA	%	0.13	NA	TOC	24MP-4 (3-5) 14359507
NA.	by calc	NA	NA	NA	%	2.21	NA	TOC	24MP-6 (4-6) 14359508
NA.	by calc	NA	NA	NA	%	0.73	NA	TOC	4MP-18 (4-6) 14359509

Samples analyzed and results reported on an as received basis. Soil samples are not homogeneous.

Values reported below Detection Limits are for reference only.

TC detection limit = 0.05% CC detection limit = 0.02%

TOC detection limit = 0.05%



Quality Analytical Services Since 1936 4630 Indiana Street • Golden, CO 80403

NON-CLP ANALYSIS RESULTS LABORATORY CONTROL STANDARD

Date:

03/24/95

Client: Evergreen Analytical

Lab Name: Contact: Huffman Labs Sue Zeller Contact: Patty McClellan

Huffman Lab #: 143595

LABORATORY CONTROL STANDARD

Lab	Source	Element/	True	Found	% R	Units		Method	Instrument
 ID#		Compound	Value	Value			Date	#	ID
LCS	BN 4851	TC	3.35	3.41	102	%	03/23/95	Leco CR12	#7
LCS	BN 4056	CC	11.33	11.32	100	%	03/21/95	COU-02	"tower"

SPIKE RECOVERY

Lab	Source	Element/	True	Found	% R	Units		Method	instrument
ID#		Compound	Value	Value			Date	#	ID
SPIKE	BN 4712	TC	12960	14089	109	ug C	03/23/95	Leco CR12	#7
SPIKE DUP	BN 4712	TC	14520	15357	106	ug C	03/23/95	Leco CR12	#7
SPIKE	BN 4712	CC	1080	1086	101	ug C	03/21/95	COU-02	"tower"
SPIKE DUP	BN 4712	CC	1167	1168	100	ug C	03/21/95	COU-02	"tower"



Quality Analytical Services Since 1936 4630 Indiana Street • Golden, CO 80403

NON-CLP QA/QC ANALYSIS RESULTS INITIAL AND CONTINUING CALIBRATION VERIFICATION

Date:

03/24/95

Client: Evergreen Analytical

Lab Name:

Huffman Labs

Contact: Patty McClellan

Contact:

Sue Zeller Huffma

Huffman Lab #: 143595

INITIAL CALIBRATION

Lab	Source	Element/	True	Found	% R	Units		Method	instrument
ID#		Compound	Value	Value			Date	#	ID
ICS	BN 4712	TC	12.00	11.92	99	%	03/23/95	Leco CR12	#7
ICS	BN 4712	CC	12.00	11.96	100	%	03/21/95	COU-02	"tower"

Slope =

NA

Intercept =

Single point calibrations for this test.

95% Correlation Coefficient =

NA NA

CONTINUING CALIBRATION VERIFICATION

instrument	Method		Units	% R	Found	True	Element/	Source	Lab
ID	#	Date			Value	Value	Compound		ID#
#7	Leco CR12	03/23/95	%	102	12.19	12.00	TC	BN 4712	ccs
#7	Leco CR12	03/23/95	%	101	12.07	12.00	TC	BN 4712	CCS
#7	Leco CR12	03/23/95	%	98	11.81	12.00	TC	BN 4712	CCS
"tower"	COU-02	03/21/95	%	100	11.96	12.00	CC	BN 4712	CCS
"tower"	COU-02	03/21/95	%	99	11.92	12.00	CC	BN 4712	ccs
"tower"	COU-02	03/21/95	%	99	11.93	12.00	CC	BN 4712	ccs
"tower"	COU-02	03/21/95	%	100	11.97	12.00	CC	BN 4712	CCS

LABORATORIES, INC. Quality Analytical Services Since 1936 Olindiana Street • Golden, CO 80403 ANALYSIS: TOTAL CARBON METHOD : HIGH TEMP COMB. - INFRARED DET. INSTRUMENT: LECO CR12 ANALYZER # 7

BALANCE # 19

L.J. CALCIUM CARBONATE STD. N.I.S.T. BUFFALO RIVER SEDIMENT (BRS) BN 4712 3.348 %C (theory) 12.00 %C (theory)

SAMPLE	SAMPLE WT G			X CARBON PRE- CALIB	CARBON POST- CALIB		QC	REC.
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				- 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1	= -			
27				77-70				
12 - 25k				+				
NC								
CaCO3	0./03			11.88	11.92	-	TCS 52,7CC	
Callos	0.115			11.95			ررح	99.6
CaCO3	0.123			12.09			<u> </u>	100.8
BL	1.0000			608			MB	<u> </u>
<u> </u>	1,0000		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0.001			IB	:
BRS	0.271			3411			بدح	1019
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ANDLYST / DATE 3-23-95 REVIEWED SUL DATE 3/24/95 PAGE / OF 3

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MORNING
TO DAY 13/2 PAGE (THE ME)

LABORATORIES, INC.

Ouality Analytical Services Since 1936

4630 Indiana Street - Golden, CO 80403

ANALYSIS: TOTAL CARBON METHOD: HIGH TEMP
COMB. - INFRARED DET.
INSTRUMENT: LECO CR12 ANALYZER # 7
BALANCE # 19

STD. CALCIUM CARBONATE		STD. N.I.S.T. BUFFALO RIVER	R SEDIMENT (BRS)
12.00 %C (theory)	BN 47/2	3.348 %C (theory)	bn 4851

SAMPLE #	SAMPLE WT G			CARBON PRE- CALIB	CARBON POST- CALIB		QC	% REC.
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13								
M3BL	1,0000				0.002		IB	
Z BRS	0.310				3.429		درج	102.4
Call'3	0.116				12.19		ردح	101.6
Sucres.	0.05 <i>E</i>				42.56		CCS	101.1
Sucrese	0.091				4z.70		ccs	101.4

ANALYST ANALYST DATE 3-23-95 REVIEWED ST. DATE 3/24/10 PAGE 2 0F3

LABORATORIES, INC.

Ouality Analytical Services Since 1936

10 Indiana Street - Colden, CO 80403

ANALYSIS: TOTAL CARBON	METHOD: HIGH TEMP COMB INFRARED DET.
INSTRUMENT: LECO CR12	ANALYZER # 7
BALANCE # 19	

S.D. CALCIUM CARBONATE		STD. N.I.S.T. BUFFALO RIVER	SEDIMENT (BRS)
12.00 %C (theory)	BN 4712	3.348 %C (theory)	BN 4851

SAMPLE #	SAMPLE WT G			% CAREON PRE- CALIB	CARBON POST- CALIB		qc	% REC.
1435 CFS	3 1,000				0.001		邛	
143501	2.195				0.041	5	±2.50%	
143501	2.067				0.039		OF MEAN	
143501	2.138				0,659)		
+21KE	0.108							
143501	2.026	1		(0.758)			
+SPIKET	0.121							
14350Z	2.154				0.045			
• 203	3.3320				0.043			
143504	2.888				0.036			
1435 05	3.555				0.043			
1435,06	3.331				0.213			
BRS	0.316				3.436	<i></i> .	C5	102 4
Ca(03	0.115				12.07		(CS)	
BL	1,000				0.004		IB	
H35 07	2.908		(H)		0.126			
143508	3.093				2.213			
143509	3.394				0.727			
BRS	0.249				3.437		ccs	102.7
	0.134				11.81			98.4

			,	
ANALYSTD /	DATE	REVIEWED (DATE 1 1/	PAGE 2 OF 2
Varia Grande	3-23-05	X.		1
(1116 1100111111	5-25-95		7/44/10	

7/27/93

LABORATORIES, INC.

Quality Analytical Services Since 1936 4630 Indiana Street - Golden, CO 80403

ANALYSIS	CARBONATE	METHOD	SOP COU-02
ANALYZER #	6	COULOMETER #	Tower
BALANCE #	10	£ :: 00: 00: 00: 00: 00: 00: 00: 00: 00:	100000000 00000 00000 00000 00000 00000 0000

CALCIUM CA (EEE # DTZ)		90TTLE # 4712	% C THEOR	Y = 12.00%	SOD Na2	NUM CARBO		017LE# 4056	%C THEOR	Y = 11.5
SAMPLE NO.	TARE WT. GRAMS	TARE + SAMPLE WT.	SAMPLE WT. GRAMS	NOTES		COUNTS LI GRAMS	BLANK LESS	NOBRD & EA ETANOBRAD NOBRAD		RECOVERY
Blank						6.2			IB	
Bout Bl						6.4			MB	
	, .							\$ 130 m	1	
#CaC03	0.602094	0 511777	0.009693			1164.8	1153.8	11.96	ICS	99.63%12
= No2CO3	0.601000	0.611682	0.010692			1215.4	1209.4	11.32	405	99.93%, sec
		21221 1122	01011-01			ე. ಀ		4000-		3
										100%
	: <u></u>					2 (1.80)		<u> </u>		
#CaCO3	0.549270	0.560589	>.011319			1360,3	13543	11-96	ccs	99.71 % rac
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1435-01	0.543314	0.654615	0.111301			7.1	1,1	0.001	* 	
14 -5-01	0.565839	0.824429	0,253539			8.5	2.5	0.001	dup	
#Ca(03)).575053	7.599070	0.014017			1676.7	1670.7	11.92	ccs	99.33 /12
went to	lunch									
		0.636929				1410.2	1404.2	11.93	CCS	99.41 7.00
+ "Cacoz) = + "Cacoz) = + 1),6737cCk 1,536372	0.6327000 0.673700	0.009000 0.1143231			1092.0	1086,0	100.75% rec	يه) رباتها	t. spille 4
Airal 15	Herman	DATE	3-21-9	I PEVIEV	<u>∵</u> €0	3/	DATE	3/22/15	-	.7

LABORATORIES, INC.

Cuality Analytical Services Since 1936

4630 Indiana Street • Colden, CO 80403

			 		
CALCIUM CARBONATE	BOTTLE #	% C THEORY = 12.00%	SODIUM CARBONATE	BOTTLE #	%C THEORY = 11.33 %
(STD # 333) CaCO3	4712	}	Na2CO3	1 4056	
		·			

SAMPLE NO.	TARE WT.	TARE + SAMPLE WT.	SAMPLE WT. GRAMS	NOTES	COUNTS µGRAMS	BLANK	% CARBON AB CARBONATE CARBON	****	% RECOVERY
		0.544936	0.009725		1174.4	1168.4	99.98% rec	spilte dup	see ipite she
			0110200						
1435-10	0 (1825)	1	0.184750		7.8	1.8	100.0	' '	
		0.964216	}		8.4	2.4	0.001		
1435-04	0.544141	0.764840	n.220699		8.2	2.2	0.001		
1435-05	0.56 4 375	0.690941	0.126566		7.3	1.3	0.001		
1435-06	0.582620	0.712407	0.129787		6.8	0.8	0.001		
1435-07	0.557046	0.684879	0.127833	<u>,</u>	7.2	1.2	0.001		+
					1000				ا ن
#CaC03	0,659955	0.670446	0,010591		1269.4	12634	11.93	CC5	99.41 %rc
_ i		0.644224	! i		8.5	2.5	0.002		-
1435-09	<u>0,543937</u>	0.709064	0.165127		7.5	1.5	100.0		
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(#C.C2.)	0/51110	2:(15/3	O ALAHAA!						r.
					.000				
#Ca(03)	9.670032\ 	D -631088	0.011056		1 1327.0	1323,0	11.97	CCS	99.72 % rec
	<u> </u>						İ		

ANALIST Tom Harman CATE 3-2+95 REVIEWED S. CATE 3/22/95 PAGE 2 OF 2



CASE NARRATIVE

Evergreen Analytical Laboratory (EAL) Project #: 95-1073

Parsons Engineering Science, Inc. (PES) Project: MacDill AFB (722450.21020)

Sample Receipt

On April 4, 1995, eight soil samples and one trip blank were received in good condition at EAL. Upon sample receipt confirmation, John Hicks of PES instructed the laboratory to perform MS/MSD analysis on a sample submitted for BTEX. On April 5, 1995, John Hicks requested that MS/MSD analysis for TVH be performed on sample 75MP-7D. Refer to the EAL Sample Log Sheet for specific log-in information and cross-reference of EAL and PES sample identifications.

BTEX, Water Matrix, Method 602

Method Blank contamination was reported for MB041595 for total xylenes at 0.6 UG/L and 1,2,3,4-tetramethylbenzene at 0.5 UG/L. All effected data are flagged "B".

1,2,4-trimethylbenzene was outside the EAL percent recovery control limits for MS/MSD 75MP-7S, due to the concentration of contaminant in the sample. There were no other quality control anomalies to report.

Total Volatile Hydrocarbons (TVH), Water Matrix, Method 8015M There were no quality control anomalies to report.

General Chemistry

There were no quality control anomalies to report.

Patricia A. McClellan, Project Manager

3

Evergreen Analytical Inc.

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21P 80290

STATE_C

OITY Downer

Sampler Name:

FAX #

Sciance Suite 200

AUDRESS / To Beardury

Wheal Ridge, Colorado 80033 (303) 425-6021 FAX (303) 425-6854 (800) 845-7400 FAX RESULTS Y / N 4036 Youngfield St.

Midemaler 722450, 21020 TURNAROUND REQUIRED. 30 days expedited turnaround subject to additional fee PO. CLIENT CONTACT (print)___ PROJECT I.D. EAL, QUOTE #_

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EAL use only Do not write in shaded area

ANALYSIS REQUESTED

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					TIME	
7	NIXT	nation:		DATE	SAMPLED	
vergreen Analytical Cooler No cooler Received	Please P	all inform	CLIENT	SAMPLE	IDENTIFICATION	

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Evergreen Analytical Cooler No.	Please PRINT	all information:	CLIENT SAMPLE IDENTIFICATION		75 MP - 2D		1		CLO BIANK	21my - 2508	15 mp-30		, m, / 6/ 0	HT	00:	

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PROJECT SPECIAL INSTRUCTIONS <u>94</u>

Date: 4/5 EA	L Contact: 16	tt ₇ cli	ient Contact:	John Hicks
		,		Pareons ES
INSTRUCTIONS:				
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Evergreen Analytical Sample	Receipt/	Check-in Re	cord 05	\$18.21.211 *
Date & Time Rec'd: 4495		Via: FCd	±X_	
client: Parsons		(Airbill # if	applical	ble)
Client Project ID(s): 727450. 210	20			
EAL Project #(s):95-1073	EAL	Cooler(s):	Y	N .
Cooler# 419				
Ice packs Y N Y N Y	И	Y N	Y N	•
Temperature & COLD	 _			
		Y	N	N/A
 Custody seal(s) present: Seals on cooler intact Seals on bottle intact 				
2. Chain of Custody present:				•
Containers broken or leaking: (Comment on COC if Y)				
4. Containers labeled:				•
5. COC agrees w/ bottles received: (Comment on COC if N)				
<pre>6. COC agrees w/ labels: (Comment on COC if N)</pre>				
7. Headspace in VCA vials-waters only (comment on COC if Y)				·
8. VOA samples preserved:				
9. pH measured on metals, cyanide or phList discrepancies*Non-EAL provided containers only,				
10. Metal samples present:				
Total, Dissolved				•
D or PD to be filtered:				
T,TR,D,PD to be Preserved:				
11. Short holding times: Specify parameters				- •
12. Multi-phase sample(s) present:				
13. COC signed w/ date/time:				_
Comments:				••••••••••••••••••••••••••••••••••••••
(Additional comments on back) file (Custodian Signature/Date:	MnG1	414191)	

COMPANY 122MS (INSIDERING JELANCE SO 290 ADDRESS / KO BRANDWAY - SLALTE 20 FAX # STATE CO HONE 303-831 -8100 OITY DOMOGE

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4036 Younglield St. Wheat Ridge, Colorado 80033 FAX RESULTS Y / N FAX (303) 425-6854 (800) 845-7400 (303) 425-6021

Evergreen , Ilytical Inc.

-t-10-16 CLIENT CONTACT (pnn) Codd Wyngleing CLIENT 722450, 21020 PROJECT L.D.

30 disys TURNAROUND REQUIRED.

EAL. QUOTE #

*expedited turnaround subject to additional fee

Do not write in shaded area

EAL use only

ANALYSIS REQUESTED

MATRIX

419

Grint MARK (signature) / Lh Sampler Name:

EAL Sample No.

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Project #

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EVERGREEN ANALYTICAL, INC. 4036 Youngfield St. Wheat Ridge, CO 80033 (303) 425-6021

Method 602 Data Report

Client Sample Number : MD75-MW7 Client Project No. : 722450.21020/MacDil Lab Sample Number : X05204 Lab Project No. : 95-1073 Date Sampled : 4/2/95 Dilution Factor : 1.00 **Date Received** Method : 602 : 4/4/95 Date Prepared : 4/16/95 Matrix : Water Date Analyzed : 4/16/95 Lab File No. : BX2041613 Method Blank No. : MB041695

Compound Name	Cas Number	Sample Concentration ug/L	RL ug/L
Benzene	71-43-2	Ū	0.4
Toluene	108-88-3	U	0.4
Chlorobenzene	108-90-7	U	0.4
Ethyl Benzene	100-41-4	U	0.4
Total Xylenes	108-38-3, 106-42-3	U	0.4
(m, p & o) 1,3,5-Trimethylbenzene	and 95-47-6 108-67-8	U	0.4
1,2,4-Trimethylbenzene	95-63-6	U	0.4
1,2,3-Trimethylbenzene	526-73-8	U	0.4
1,2,3,4-Tetramethylbenzene	488-23-3	U	0.4
Surrogate Recovery (\alpha, \alpha, \alpha-Trifluo	rotoluene):	85%	70%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

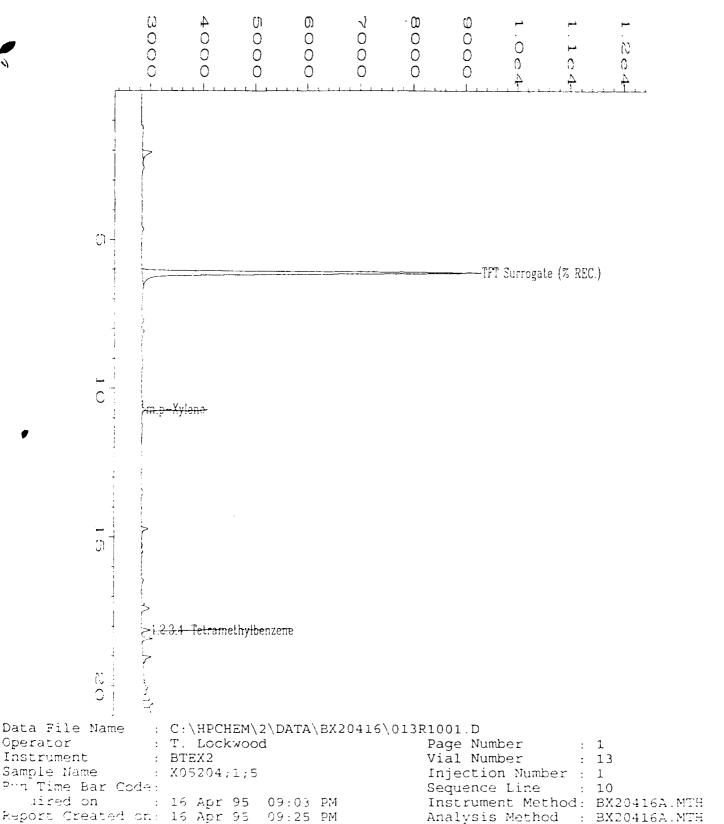
B = Compound also found in the blank.

J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

RL = Reporting Limit.

NA = Not Available/Not Applicable.

Arialyst



Report Created on: 16 Apr 95 09:25 PM Analysis Method Last Recalib on : 16 APR 95 06:25 PM Sample Amount Multiplier : 1 ISTD Amount Sample Info : Project#: 95-1073 Client#: MD75-MW7 Water

EVERGREEN ANALYTICAL, INC. 4036 Youngfield St. Wheat Ridge, CO 80033 (303) 425-6021

Method 602 Data Report

Client Sample Number : MD75-MW15 Client Project No. : 722450.21020/MacD Lab Sample Number : X05202 Lab Project No. : 95-1073 Date Sampled : 4/2/95 **Dilution Factor** : 1.00 **Date Received** : 4/4/95 Method : 602 Date Prepared : 4/15/95 Matrix : Water Date Analyzed : 4/15/95 Lab File No. : BX2041517 Method Blank No. : MB041595

Compound Name	Cas Number	Sam _l Concentra ug/L		RL ug/L	(
Benzene	71-43-2		U	0.4	
Toluene	108-88-3		U	0.4	
Chlorobenzene	108-90-7		U	0.4	!
Ethyl Benzene	100-41-4		U	0.4	
Total Xylenes (m, p & o)	108-38-3, 106-42-3	0.6	В	0.4	
1,3,5-Trimethylbenzene	and 95-47-6 108-67-8		υ	0.4	ı
1,2,4-Trimethylbenzene	95-63-6		U	0.4	
1,2,3-Trimethylbenzene	526-73-8		U	0.4	
1,2,3,4-Tetramethylbenzene	488-23-3	0.4	В	0.4	1

Surrogate Recovery (α,α,α -Trifluorotoluene):

71%

70%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute. The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

B = Compound also found in the blank.

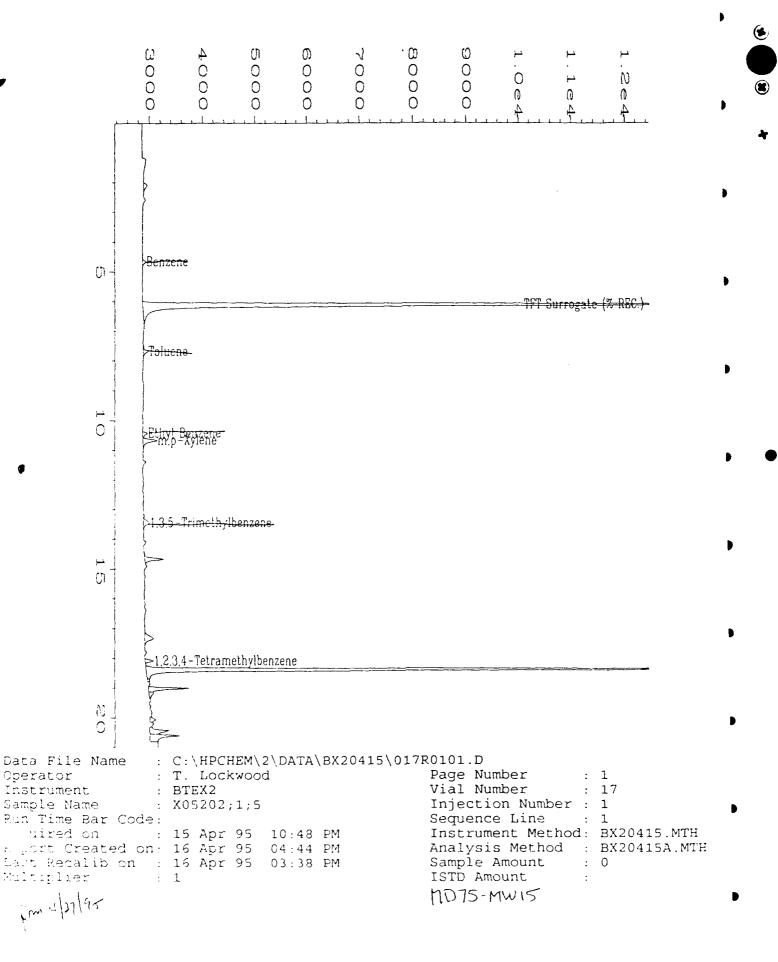
J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

RL = Reporting Limit.

NA = Not Available/Not Applicable.

Analyst

Approved



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Method 602 Data Report

Client Sample Number Lab Sample Number Date Sampled Date Received Date Prepared Date Analyzed	: 75MP-3D : X05203 : 4/2/95 : 4/4/95 : 4/16/95 : 4/16/95	Client Project No. Lab Project No. Dilution Factor Method Matrix Lab File No.	: 722450.21020/MacDill : 95-1073 : 1.00 : 602 : Water : BX2041612
		Method Blank No.	: MB041695

Compound Name	Cas Number	Sample Concentration ug/L	RL ug/L
Benzene	71-43-2	U	0.4
Toluene	108-88-3	U	0.4
Chlorobenzene	108-90-7	U	0.4
Ethyl Benzene	100-41-4	U	0.4
Total Xylenes (m, p & o)	108-38-3, 106-42-3 and 95-47-6	U	0.4
1,3,5-Trimethylbenzene	108-67-8	U	0.4
1,2,4-Trimethylbenzene	95-63-6	U	0.4
1,2,3-Trimethylbenzene	526-73-8	U	0.4
1,2,3,4-Tetramethylbenzene	488-23-3	U	0.4

Surrogate Recovery $(\alpha, \alpha, \alpha$ -Trifluorotoluene):

91%

70%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

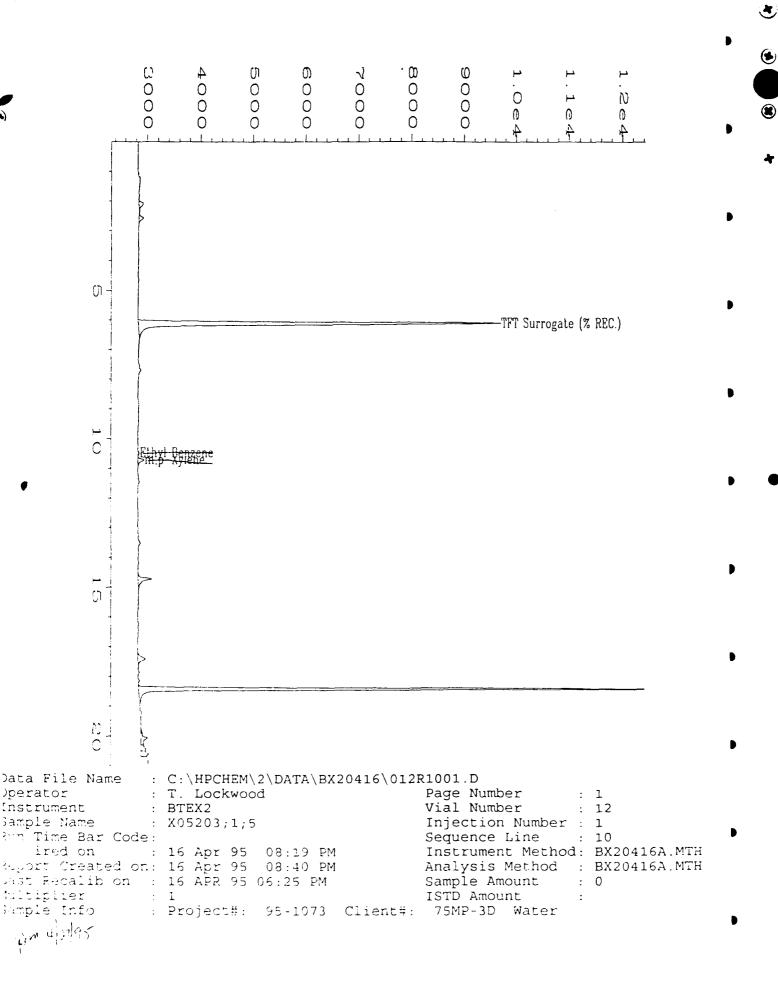
B = Compound also found in the blank.

J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

RL = Reporting Limit.

NA = Not Available/Not Applicable.

Analyst



Method 602 Data Report

Client Sample Number : 75MP-7S Client Project No. : 722450.21020/MacD Lab Sample Number : X05206 Lab Project No. : 95-1073 **Date Sampled** : 4/2/95 **Dilution Factor** : 1.00 **Date Received** : 4/4/95 Method : 602 **Date Prepared** : 4/16/95 Matrix : Water Date Analyzed : 4/16/95 Lab File No. : BX2041615 Method Blank No. : MB041695

Compound Name	Cas Number	Sample Concentration ug/L	RL ug/L	
Benzene	71-43-2	U	0.4	
Toluene	108-88-3	3.3	0.4	
Chlorobenzene	108-90-7	U	0.4	
Ethyl Benzene	100-41-4	4.0	0.4	
Total Xylenes (m, p & o)	108-38-3, 106-42-3 and 95-47-6	11	0.4	
1,3,5-Trimethylbenzene	108-67-8	25	0.4	
1,2,4-Trimethylbenzene	95-63-6	50	0.4	
1,2,3-Trimethylbenzene	526-73-8	22	0.4	
1,2,3,4-Tetramethylbenzene	488-23-3	12	0.4	

Surrogate Recovery (α, α, α -Trifluorotoluene): 85% 70%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

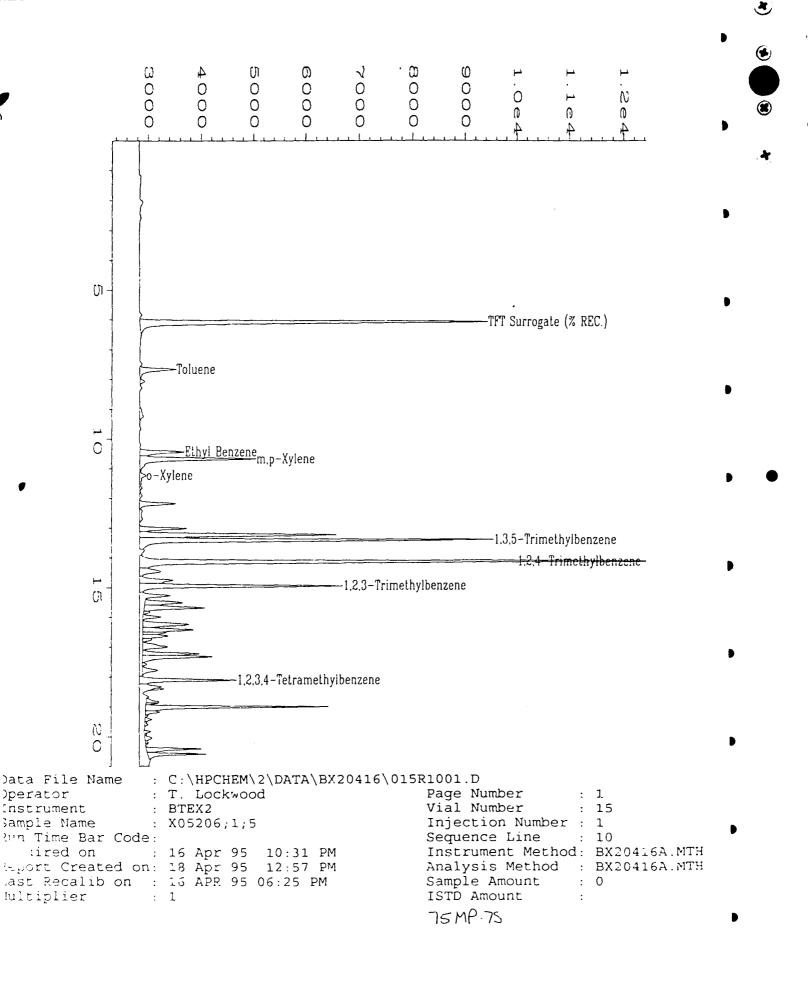
B = Compound also found in the blank.

J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

RL = Reporting Limit.

NA = Not Available/Not Applicable.

Analyst



Method 602 Data Report

Client Sample Number	: 75MP-7S	Client Project No.	: 722450.21020/MacDi
Lab Sample Number	: X05206DUP	Lab Project No.	: 95-1073
Date Sampled	: 4/2/95	Dilution Factor	: 1.00
Date Received	: 4/4/95	Method	: 602
Date Prepared	: 4/16/95	Matrix	: Water
Date Analyzed	: 4/16/95	Lab File No.	: BX2041616
		Method Blank No.	: MB041695

		Sample	
Compound Name	Cas Number	Concentration	RL
		ug/L	ug/L
Benzene	71-43-2	U	0.4
Toluene	108-88-3	3.1	0.4
Chlorobenzene	108-90-7	U	0.4
Ethyl Benzene	100-41-4	3.9	0.4
Total Xylenes	108-38-3, 106-42-3	7.6	0.4
(m, p & o)	and 95-47-6		
1,3,5-Trimethylbenzene	108-67-8	21	0.4
1,2,4-Trimethylbenzene	95-63-6	43	0.4
1,2,3-Trimethylbenzene	526-73-8	34	0.4
1.2,3,4-Tetramethylbenzene	488-23-3	9.6	0.4
Surrogate Recovery (α,α,α-Trifluo	votoluene):	80%	70%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

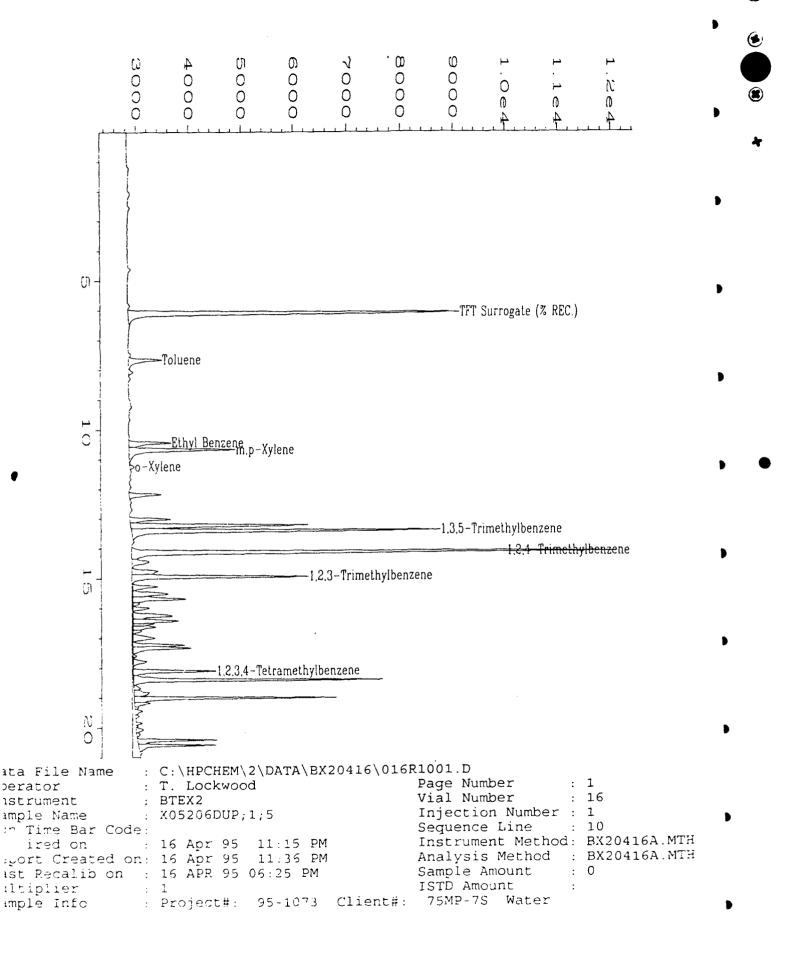
B = Compound also found in the blank.

J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

RL = Reporting Limit.

NA = Not Available/Not Applicable.

Analyst



Method 602 Data Report

Client Sample Number	: 75MP-7D	Client Project No.	: 722450.21020/MacDil
Lab Sample Number	: X05205	Lab Project No.	: 95-1073
Date Sampled	: 4/2/95	Dilution Factor	: 1.00
Date Received	: 4/4/95	Method	: 602
Date Prepared	: 4/16/95	Matrix	: Water
Date Analyzed	: 4/16/95	Lab File No.	: BX2041614
		Method Blank No.	: MB041695

		Sample		•
Compound Name	Cas Number	Concentration	RL	
		ug/L	ug/L	
Benzene	71-43-2	U	0.4	
Toluene	108-88-3	U	0.4	
Chlorobenzene	108-90-7	U	0.4	
Ethyl Benzene	100-41-4	U	0.4	
Total Xylenes (m, p & o)	108-38-3, 106-42-3 and 95-47-6	U	0.4	
1,3,5-Trimethylbenzene	108-67-8	U	0.4	
1,2,4-Trimethylbenzene	95-63-6	U	0.4	
1,2,3-Trimethylbenzene	526-73-8	U	0.4	
1,2,3,4-Tetramethylbenzene	488-23-3	U	0.4	

Surrogate Recovery $(\alpha, \alpha, \alpha$ -Trifluorotoluene):

85%

70%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

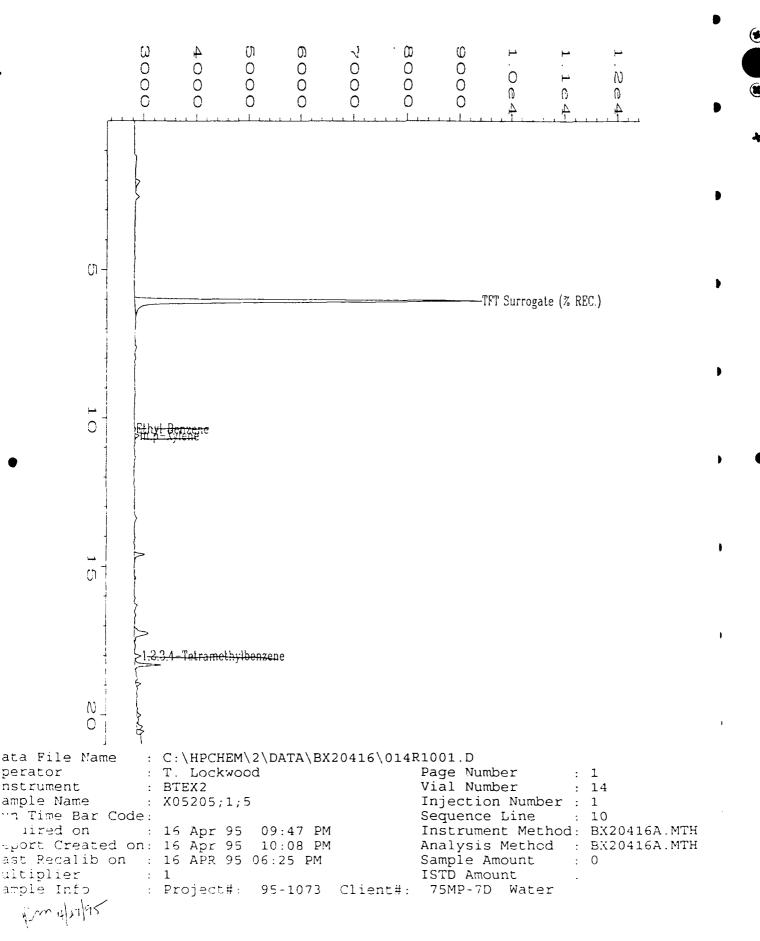
B = Compound also found in the blank.

J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

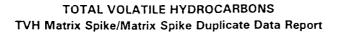
RL = Reporting Limit.

NA = Not Available/Not Applicable.

Analyst



Evergreen Analytical, Inc. 4036 Youngfield, Wheat Ridge, CO 80033 (303) 425-6021



Client Sample No.

: 75MP-7D

Client Project No.

: 722450.21020

Lab Sample No.

: X05205

Lab Project No. EPA Method No.

: 95-1073 : 5030/8015 Mod.

Date Sampled

: 4/2/95 : 4/3/95

Matrix

: Water

Date Received Date Prepared

: 4/3/95 : 4/16/95

Method Blank

: MB041495

Date Analyzed

: 4/16/95

	Spike	Sample	MS		σc
Compound	Added	Concentration	Concentration	MS	Limits
	(mg/L)	(mg/L)	(mg/L)	%REC	%REC
Gasoline	2.00	0.00	1.96	98%	60-140

	Spike	MSD			C	ıc
Compound	Added	Concentration	MS	RPD	Lir	nits
	(mg/L)	(mg/L)	%REC		RPD	%REC
Gasoline	2.00	2.62	131%	29	50	60-140

* =	Values	outside	of QC	limits.
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RPD:

0 out of (1) outside limits.

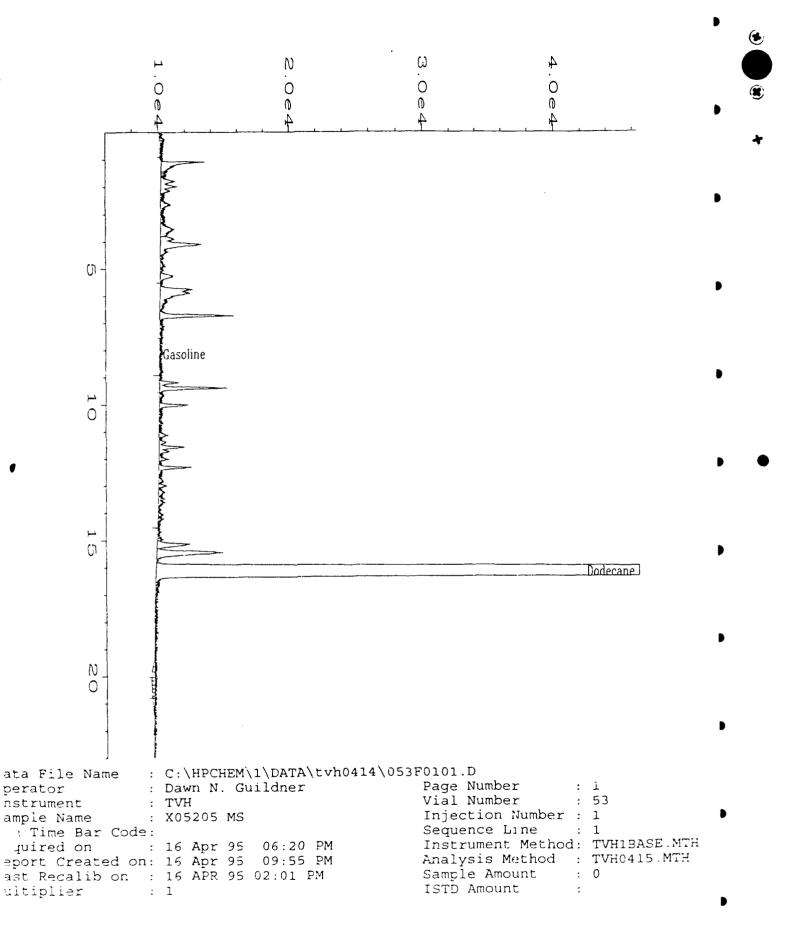
Spike Recovery:

0 out of (2) outside limits.

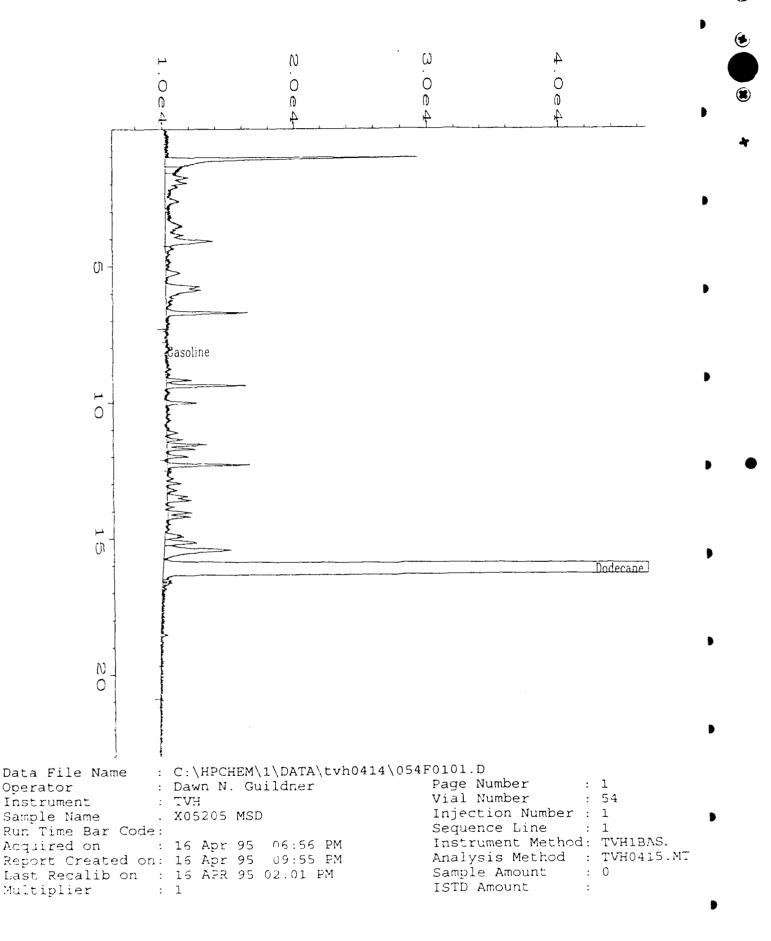
Comments:

NA = Not analyzed/not applicable.

::/W 4/25/95



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Evergreen Analytical, Inc. 4036 Youngfield, Wheat Ridge, CO 80033 (303) 425-6021

BTEX Matrix Spike/Matrix Spike Duplicate Data Report

Client Sample No. : 75MP-7S Client Project No. : 722450.21020/MacDill Lab Sample No. : X05206 Lab Project No. : 95-1073

 Lab Sample No.
 : X05206
 Lab Project No.
 : 95-107

 Date Sampled
 : 4/2/95
 EPA Method No.
 : 602

 Date Received
 : 4/4/95
 Matrix
 : Water

 Date Prepared
 : 4/16/95
 Lab File Number(s)
 : BX2041617,18

 Date Analyzed
 : 4/16/95
 Method Blank
 : MB041695

	Spike	Sample	MS		QC
Compound	Added	Concentration	Concentration	MS	Limits
	(ug/L)	(ug/L)	(ug/L)	%REC	%REC
Benzene	20.0	0.0	14.0	70	50-150
Toluene	20.0	3.3	18.5	76	50-148
Ethyl Benzene	20.0	4.0	20.9	85	50-150
m,p-Xylene	40.0	8.9	42.6	84	50-150
o-Xylene	20.0	2.4	15.3	65	50-150
Chlorobenzene	20.0	0.0	14.0	70	55-135
1,3,5-TMB	20.0	24.8	51.1	132	50-150
1,2,4-TMB	20.0	49.7	87.9	191 *	50-150
1,2,3-TMB	20.0	21.8	47.4	128	50-150
1,2,3,4-TeMB	20.0	11.9	36.7	124	50-150

	Spike	MSD			(C
Compound	Added	Concentration	MSD	RPD	Lin	mits
	(ug/L)	(ug/L)	%REC		RPD	%REC
Benzene	20.0	13.7	69	2.2	25	50-150
Toluene	20.0	18.0	74	3.3	25	50-148
Ethyl Benzene	20.0	19.9	80	6.1	25	50 150
m,p-Xylene	40.0	42.6	84	0.0	25	50-150
о-ХуІепе	20.0	14.8	62	4.0	25	50-150
Chlorobenzena	20.0	12.9	65	8.2	25	55-135
1,3,5-TMB	20.0	49.6	124	5.9	25	50-150
1.2,4-TMB	20.0	84.0	172 *	10.8	25	50-150
1,2,3-TMB	20.0	44.6	114	11.6	25	50-150
1,2,3,4-TeMB	20.0	34.7	114	8.4	25	50-150

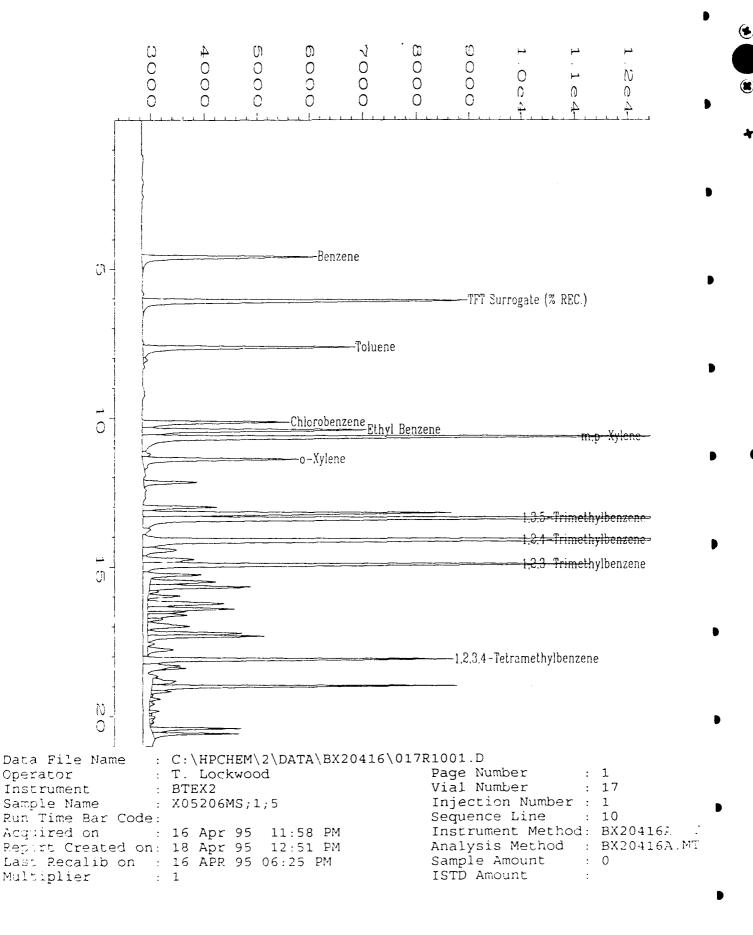
 * = Values outside of QC limits. See LCS041695. 	=	Values	outside	of	σ C	limits.	See	LCS041	695.
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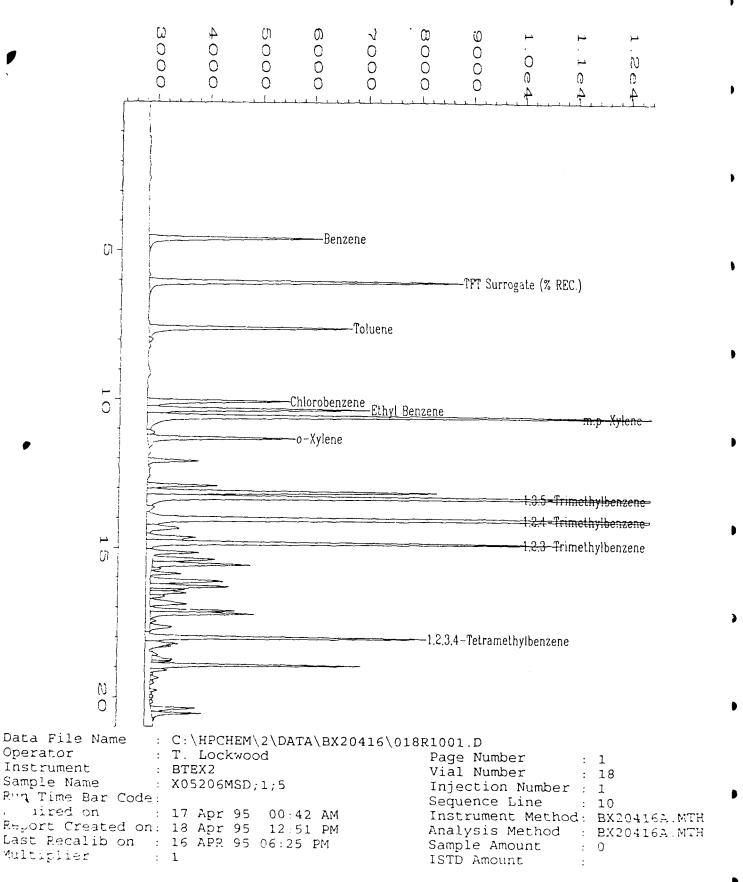
RPD: 0 out of (10) outside limits.

Spike Recovery: 2 out of (20) outside limits.

Comments:

Analyst K. Cone





Method 602 Data Report

Client Sample Number : Trip Blank Client Project No. : 722450.21020/MacD : X05207 Lab Project No. : 95-1073 Lab Sample Number Date Sampled : NA Dilution Factor : 1.00 **Date Received** : 4/4/95 Method : 602 **Date Prepared** : 4/17/95 Matrix : Water : 4/17/95 Lab File No. : BX1041710 Date Analyzed Method Blank No. : MB041795

Compound Name	Cas Number	Sample Concentration ug/L	RL ug/L	
Benzene	71-43-2	. U	0.4	
Toluene	108-88-3	U	0.4	
Chlorobenzene	108-90-7	U	0.4	
Ethyl Benzene	100-41-4	υ	0.4	
Total Xylenes	108-38-3, 106-42-3	1.3 B	0.4	
(m, p & o) 1,3,5-Trimethylbenzene	and 95-47-6 108-67-8	U	0.4	
1,2,4-Trimethylbenzene	95-63-6	U	0.4	
1,2,3-Trimethylbenzene	526-73-8	U	0.4	
1,2,3,4-Tetramethylbenzene	488-23-3	U	0.4	

Surrogate Recovery (α,α,α -Trifluorotoluene):

102%

70%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

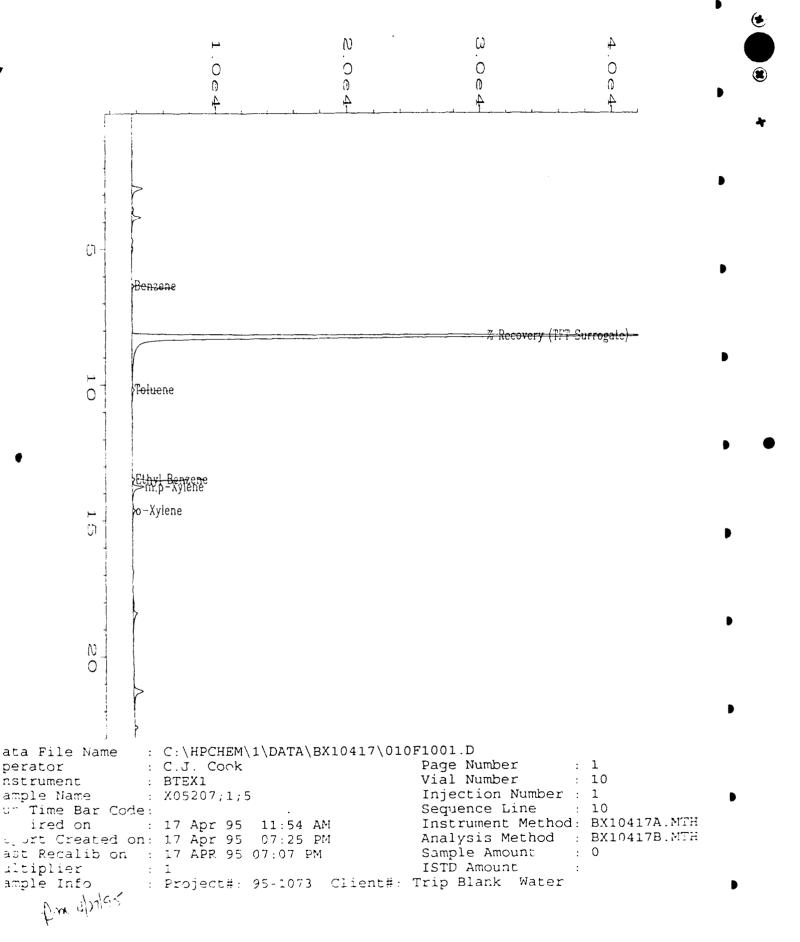
B = Compound also found in the blank.

J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

RL = Reporting Limit.

NA = Not Available/Not Applicable.

Analyst



Method 602 Data Report Method Blank Report

Method Blank Number

: MB041595

Client Project No.

: 722450.21020/MacC

Date Prepared

: 4/15/95

Lab Project No.

: 95-1073

: 1.00

Date Analyzed

: 4/15/95

Dilution Factor Method

: 602/8020

Matrix

: Water

Lab File No.

: BX2041510

		Sample		
Compound Name	Cas Number	Concentration	RL	-
		ug/L	ug/L	
Benzene	71-43-2	U	0.4	
Toluene	108-88-3	U	0.4	
Chlorobenzene	108-90-7	υ	0.4	
Ethyl Benzene	100-41-4	U	0.4	
Total Xylenes	108-38-3, 106-42-3	0.6	0.4	
(m, p & o)	and 95-47-6			
1,3,5-Trimethylbenzene	108-67-8	U	0.4	
1,2,4-Trimethylbenzene	95-63-6	U	0.4	
1,2,3-Trimethylbenzene	526-73-8	U	0.4	
1,2,3,4-Tetramethylbenzene	488-23-3	0.5	0.4	
Company December (company)		019/	70% 120% 10	

Surrogate Recovery (\alpha,\alpha,\alpha-Trifluorotoluene):

91%

70%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

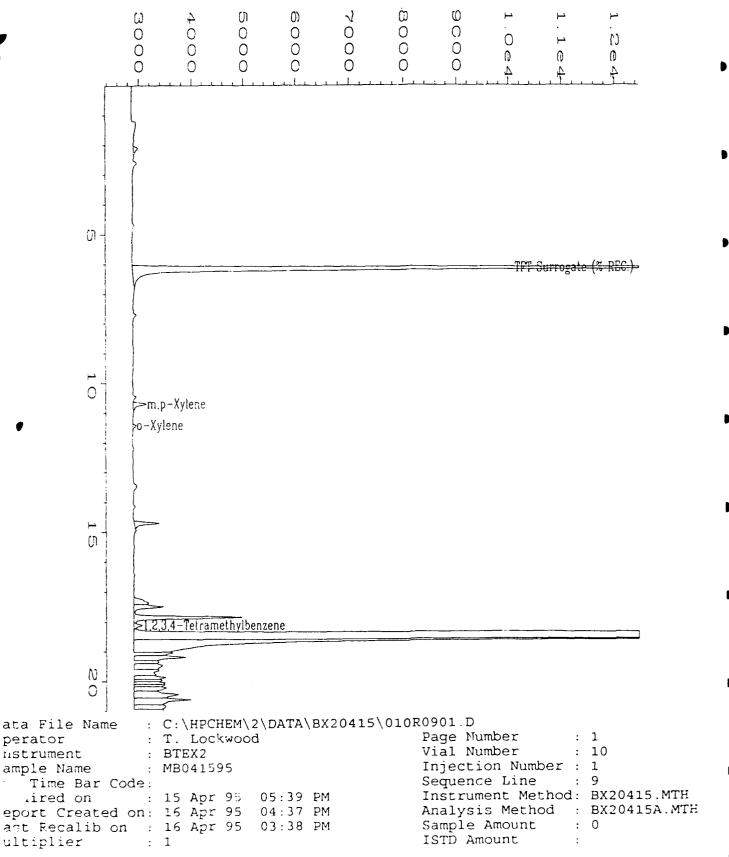
U = Compound analyzed for, but not detected.

B = Compound also found in the blank.

J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

RL = Reporting Limit.

NA = Not Available/Not Applicable.



Method 602 Data Report Method Blank Report

Method Blank Number

: MB041695

Client Project No.

: 722450.21020/MacDill

Date Prepared

: 4/16/95

Lab Project No.

: 95-1073

Date Analyzed

: 4/16/95

Dilution Factor

: 1.00

Method

: 602/8020

Matrix

: Water

Lab File No.

: BX2041610

		Sample		
Compound Name	Cas Number	Concentration	RL	
		ug/L	ug/L	
Benzene	71-43-2	U	0.4	
Toluene	108-88-3	U	0.4	
Chlorobenzene	108-90-7	U	0.4	
Ethyl Benzene	100-41-4	U	0.4	
Total Xylenes	108-38-3, 106-42-3	U	0.4	
(m, p & o)	and 95-47-6			
1,3,5-Trimethylbenzene	108-67-8	U	0.4	
1,2,4-Trimethylbenzene	95-63-6	U	0.4	
1,2,3-Trimethylbenzene	526-73-8	U	0.4	
1,2,3,4-Tetramethylbenzene	488-23-3	U	0.4	

Surrogate Recovery (a,a,a-Trifluorotoluene):

89%

70%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

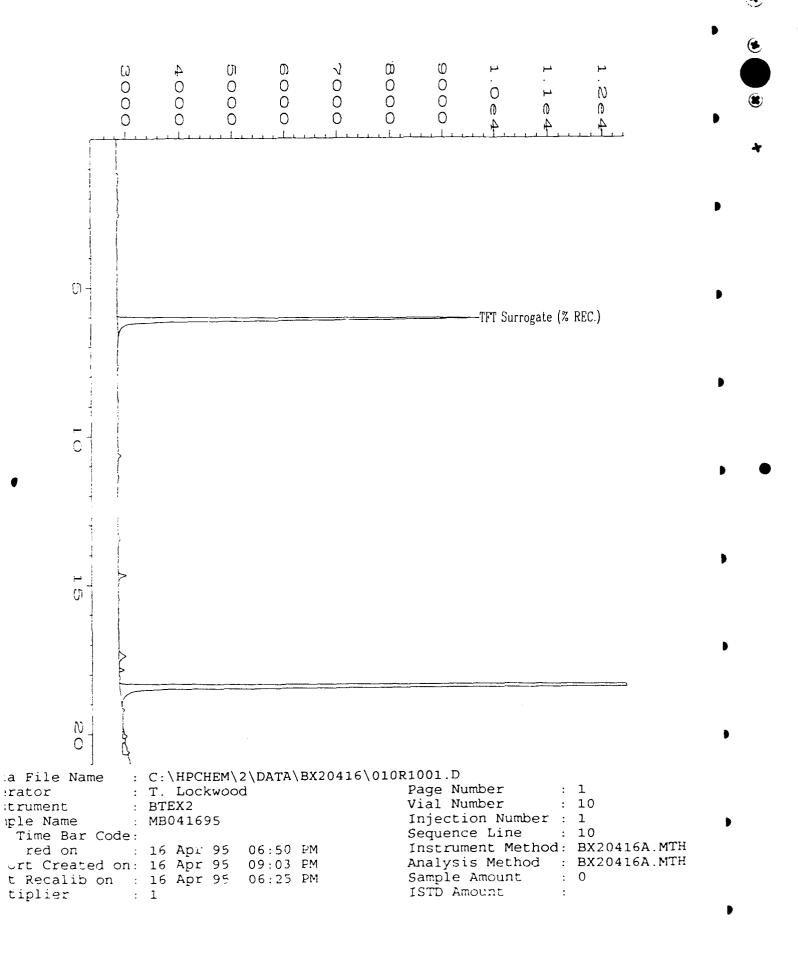
B = Compound also found in the blank.

J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

RL = Reporting Limit.

NA = Not Available/Nøt Applicable.

Analyst



Method 602 Data Report Method Blank Report

Method Blank Number

: MB041795

Client Project No.

: 722450.21020/MacDi

Date Prepared

: 4/17/95

Lab Project No.

: 95-1073

Date Analyzed : 4/17/95 Dilution Factor

: 1.00

Method

: 602/8020

Matrix

: Water

Lab File No.

: BX1041709

Compound Name	Cas Number	Sample Concentration ug/L	RL ug/L
Benzene	71-43-2	Ų	0.4
Toluene	108-88-3	U	0.4
Chlorobenzene	108-90-7	U	0.4
Ethyl Benzene	100-41-4	υ	0.4
Total Xylenes	108-38-3, 106-42-3	0.9	0.4
(m, p & o) 1,3,5-Trimethylbenzene	and 95-47-6 108-67-8	U	0.4
1,2,4-Trimethylbenzene	95-63-6	U	0.4
1,2,3-Trimethylbenzene	526-73-8	U	0.4
1,2,3,4-Tetramethylbenzene	488-23-3	υ	0.4

Surrogate Recovery (α,α,α-Trifluorotoluene):

94%

70%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

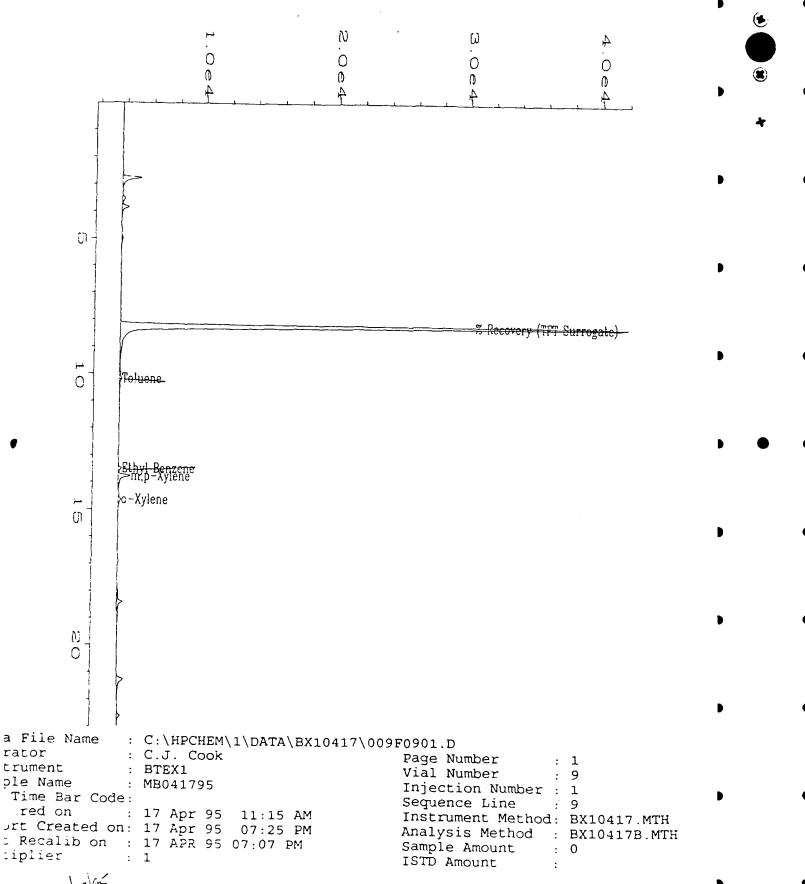
B = Compound also found in the blank.

J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

RL = Reporting Limit.

NA = Not Available/Not Applicable.

Analyst



Da 4/27/95

rator

BTEX Data Report Laboratory Control Sample (LCS)

LCS Number : LCS041595 **Dilution Factor** : 1.00 Date Extracted/Prepared : 4/15/95 Method : 602 : 4/15/95 Matrix Date Analyzed : Water Lab File No. Spike Amount (ug/L) : 20.0 : BX2041509

Compound Name	Cas Number	LCS Concentration ug/L	LCS % Recovery	QC Limit* % Recovery	ļ
Benzene	71-43-2	14.2	71.0%	71.0%-119.0%	
Toluene	108-88-3	14.7	73.5%	73.0%-111.0%	
Chlorobenzene	108-90-7	16.0	80.0%	64.0%-119.0%	
Ethyl Benzene	100-41-4	15.5	77.5%	75.0%-114.0%	
m,p-Xylene	108-38-3	16.3	81.5%	75.0%-114.0%	
o-Xylene	106-42-3 95-47-6	15.3	76.5%	64.0%-11	
1,3,5-Trimethylbenzene	108-67-8	14.6	73.0%	68.0%-101.0%	
1,2,4-Trimethylbenzene	95-63-6	16.2	81.0%	61.0%-88.0%	
1,2,3-Trimethylbenzene	526-73-8	18.0	90.0%	63.0%-101.0%	
1,2,3,4-Tetramethylbenzene	488-23-3	14.7	73.5%	58.0%-102.0%	
Surrogate Recovery (a,a,a-Trifluor	otoluene):	92%	70%-1309	% (QC limits)	

* = Limits established 4/3/95 KSC

QUALIFIERS:

E = Extrapolated value

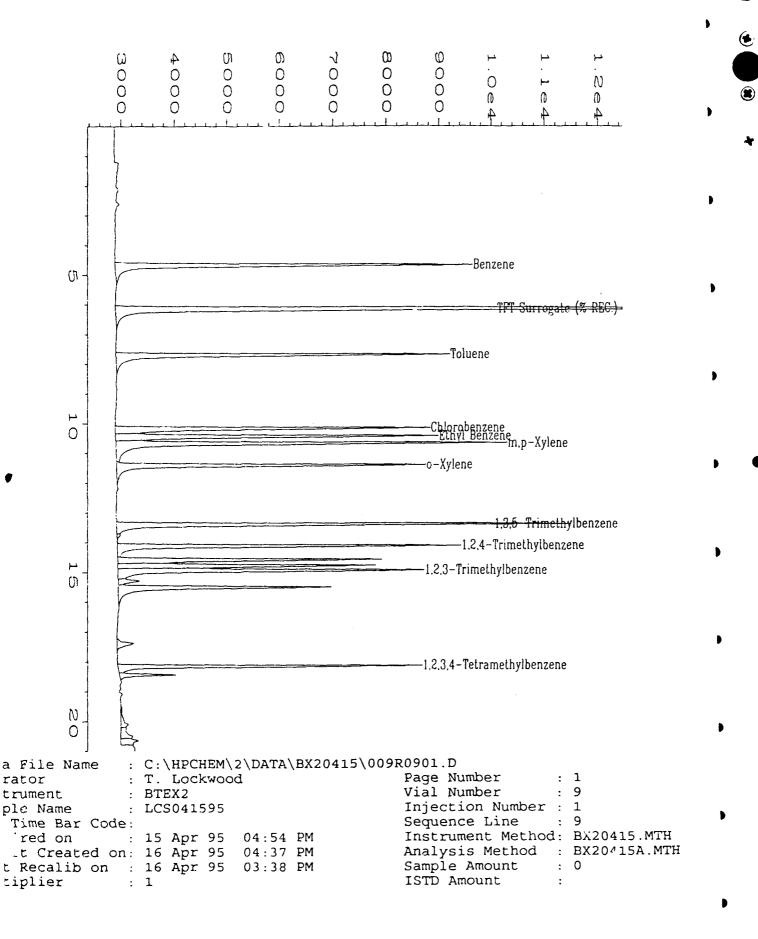
U = Compound analyzed for, but not detected.

B = Compound found in blank and sample. Compare blank and sample data.

J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

NA = Not available/Not analyzed.

Analyst



BTEX Data Report Laboratory Control Sample (LCS)

LCS Number : LCS041695 Date Extracted/Prepared : 4/16/95 Dilution Factor Method : 1.00 : 602 : Water

Date Analyzed Spike Amount (ug/L) : 4/16/95 : 20.0

Matrix Lab File No.

: BX2041609

Compound Name	Cas Number	LCS Concentration ug/L	LCS % Recovery	QC Limit* % Recovery	1
Benzene	71-43-2	14.9	74.5%	71.0%-119.0%	
Toluene	108-88-3	14.6	73.0%	73.0%-111.0%	
Chlorobenzene	108-90-7	15.2	76.0%	64.0%-119.0%	
Ethyl Benzene	100-41-4	15.6	78.0%	75.0%-114.0%	
m,p-Xylene	108-38-3	15.5	77.5%	75.0%-114.0%	
o-Xylene	106-42-3 95-47-6	15.2	76.0%	64.0%-11	
1,3,5-Trimethylbenzene	108-67-8	15.9	79.5%	68.0%-101.0%	
1,2,4-Trimethylbenzene	95-63-6	16.0	80.0%	61.0%-88.0%	
1,2,3-Trimethylbenzene	526-73-8	18.4	92.0%	63.0%-101.0%	
1,2,3,4-Tetramethylbenzene	488-23-3	17.9	89.5%	58.0%-102.0%	
Surrogate Recovery (\alpha, \alpha, \alpha-Trifluor	95%	70%-1309	% (QC limits)		

* = Limits established 4/3/95 KSC

QUALIFIERS:

E = Extrapolated value

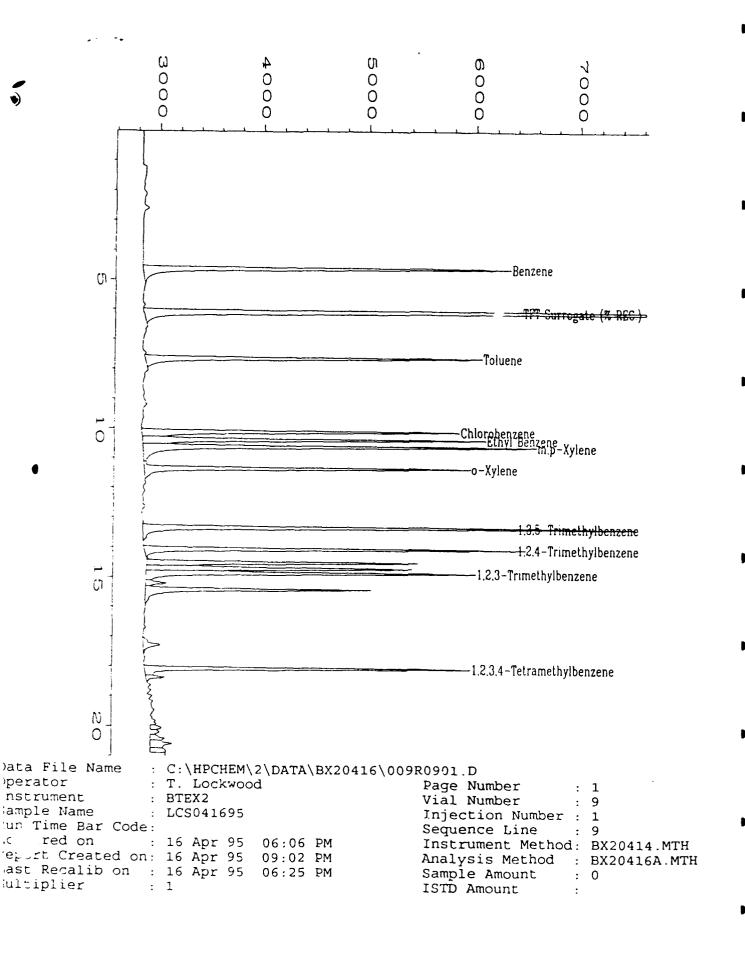
U = Compound analyzed for, but not detected.

B = Compound found in blank and sample. Compare blank and sample data.

J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

NA = Not available/Not analyzed.

Analyst



BTEX Data Report Laboratory Control Sample (LCS)

LCS Number: LCS041795Dilution Factor: 1.00Date Extracted/Prepared: 4/17/95Method: 602Date Analyzed: 4/17/95Matrix: Water

Spike Amount (ug/L) : 20.0 **Lab File No.** : BX10417008

Compound Name	Cas Number	LCS Concentration ug/L	LCS % Recovery	QC Limit % Recovery
Benzene	71-43-2	15.8	79.0	71.0-119.0*
Toluene	108-88-3	16.3	81.5	73.0-111.0*
Chlorobenzene	108-90-7	18.1	90.5	64.0-119.0*
Ethyl Benzene	100-41-4	17.2	86.0	75.0-114.0*
m,p-Xylene	108-38-3 106-42-3	17.7	88.5	75.0-114.0*
o-Xylene	95-47-6	15.7	78.5	64.0-119
1,3,5-Trimethylbenzene	108-67-8	17.0	85.0	50.0-150.0
1,2,4-Trimethylbenzene	95-63-6	18.8	94.0	50.0-150.0
1,2,3-Trimethylbenzene	526-73-8	19.1	95.5	50.0-150.0
1,2,3,4-Tetramethylbenzene	488-23-3	18.7	93.5	50.0-150.0
Surrogate Recovery (α,α,α-Trifluor	otoluene):	100%	70%-130%	(QC limits)

* = Limits established 4/3/95 KSC

QUALIFIERS:

E = Extrapolated value

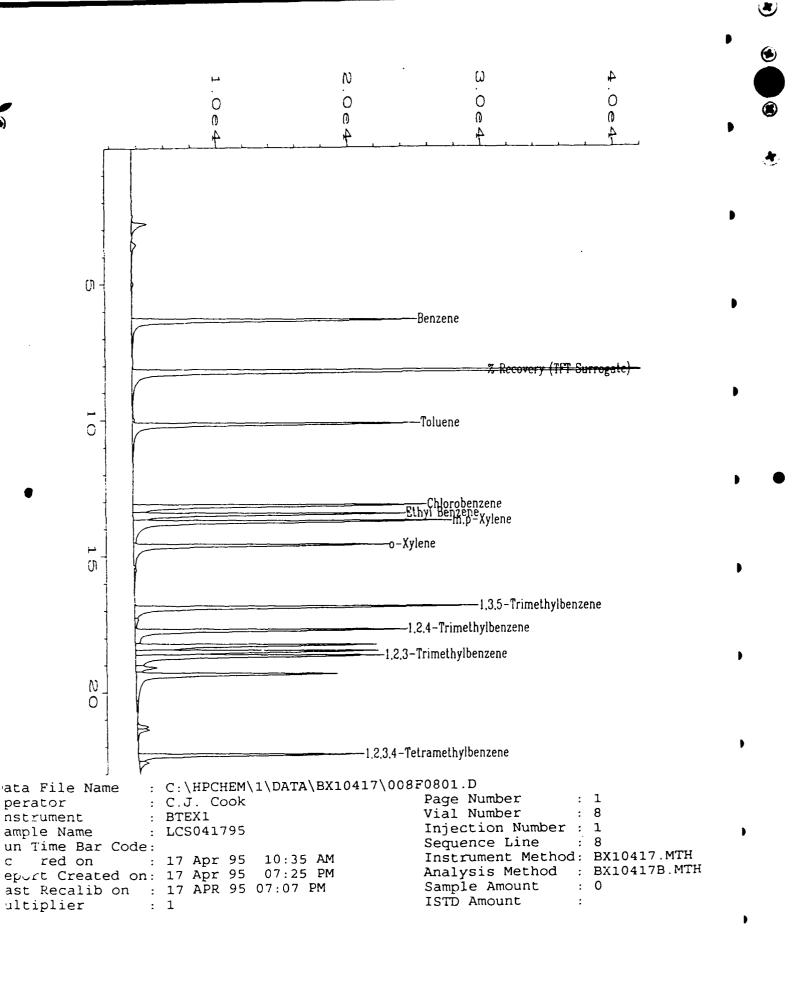
U = Compound analyzed for, but not detected.

B = Compound found in blank and sample. Compare blank and sample data.

J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

NA = Not available/Not analyzed.

Analyst





TOTAL VOLATILE HYDROCARBONS (TVH-GASOLINE)

Matrix

Date Sampled

: 4/2/95

Client Project Number

: 722450.21020

Date Received

: 4/4/95 : 4/16/95 Lab Project Number

: 95-1073 : Water

Date Prepared Date Analyzed

: 4/16/95

Method Number

: 5030/Mod.8015

Evergreen Sample #	Client Sample #	Surrogate Recovery	TVH 	RL mg/L
MB041495	METHOD BLANK	100%	U	0.1
X05202	MD75-MW15	102%	υ	0.1
X05203	75MP-3D	100%	0.2	0.1
X05204	MD75-MW7	96%	U	0.1
X05205	75MP-7D	95%	0.1	0.1
X05206	75MP-7S	94%	0.1	0.1
X05206 DUP	75MP-7S	101%	0.3	0.1

QUALIFIERS

U = TVH analyzed for but not detected.

B = TVH found in blank.

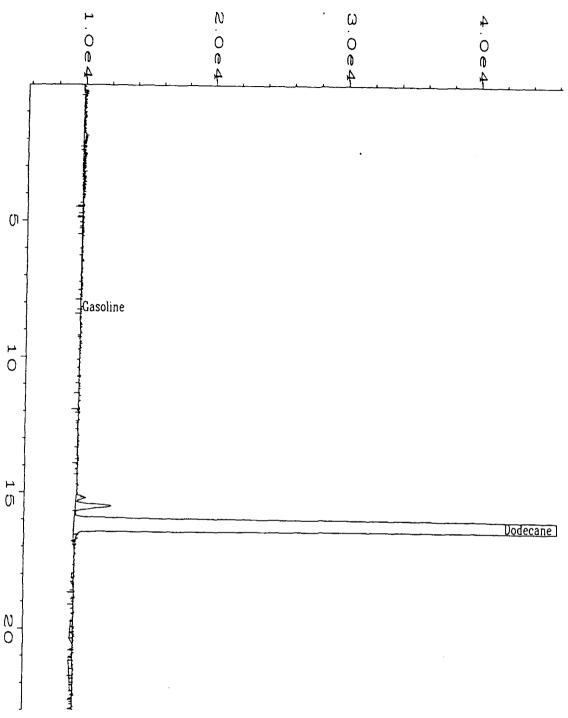
E = Extrapolated value.

RL = Reporting Limit.

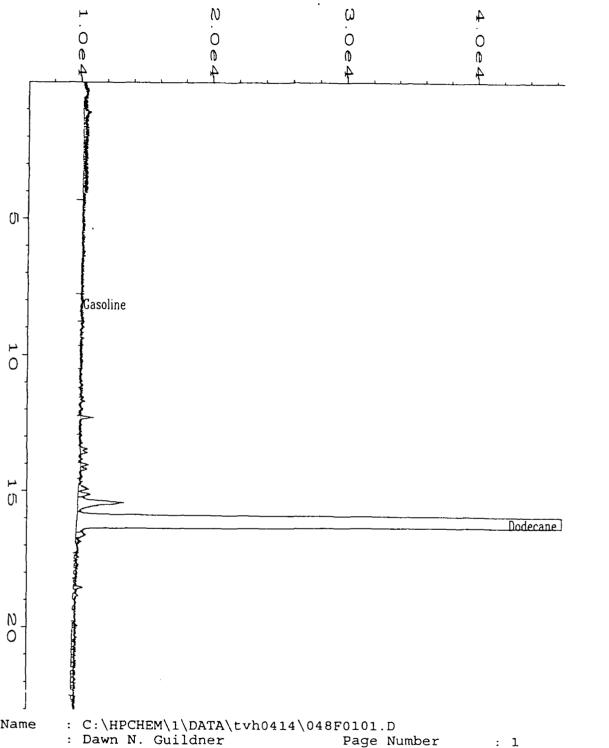
Analyst

Approved

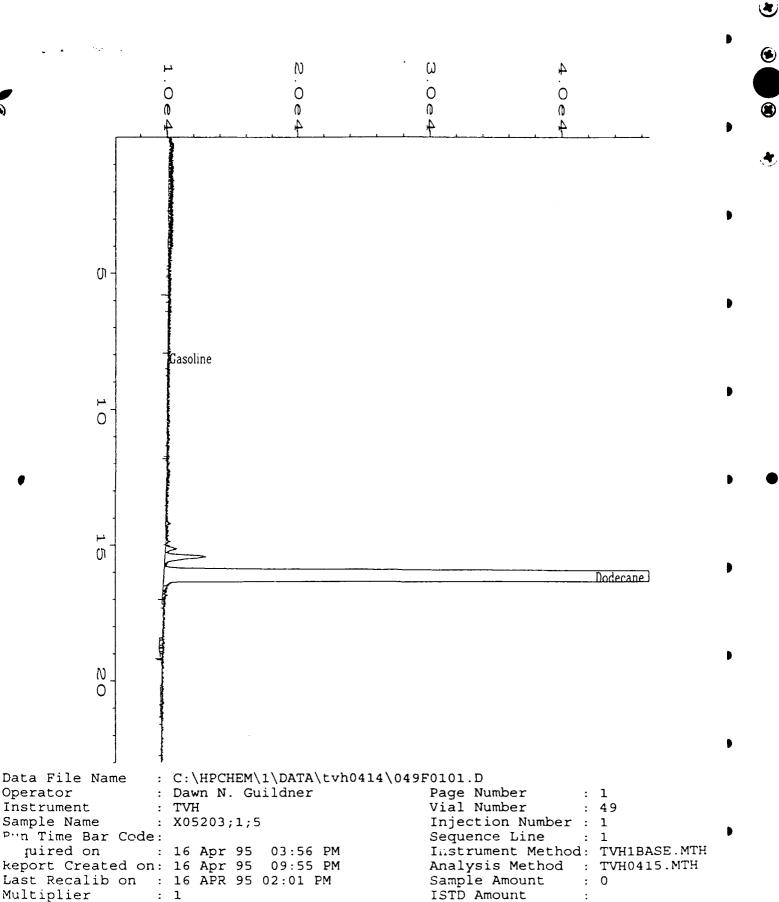
TVH1073.XLS



Data File Name : C:\HPCHEM\1\DATA\tvh0414\008F0101.D Operator : Dawn N. Guildner Page Number Vial Number Instrument : TVH : 8 Sample Name : MB041495 Injection Number : 1 Run Time Bar Code: Sequence Line : 1 A ired on : 14 Apr 95 03:35 PM Report Created on: 16 Apr 95 02:37 PM Last Recalib on : 16 APR 95 02:01 PM ired on Instrument Method: TVH1BASE.MTH Analysis Method : TVH0415.MTH Sample Amount : 0 *Multiplier* : 1 ISTD Amount

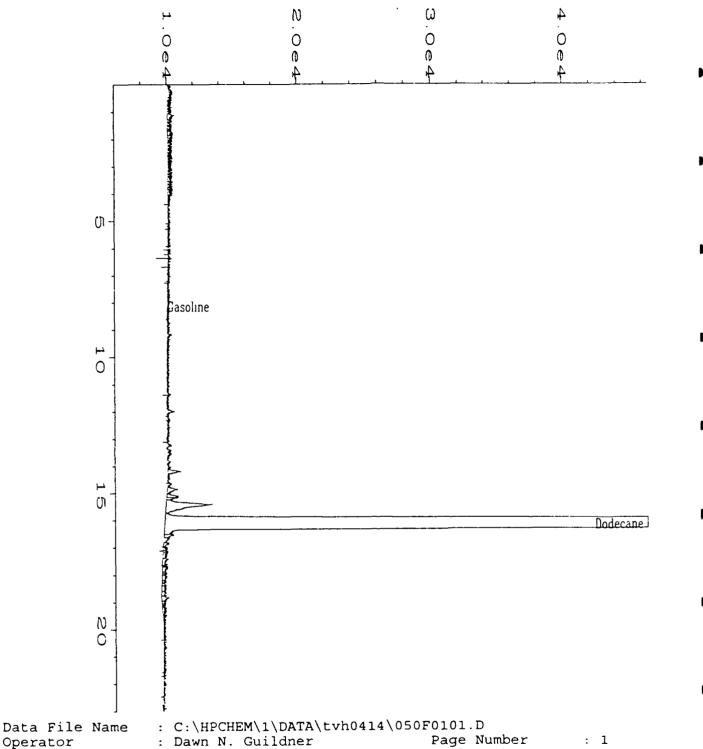


Data File Name Operator Instrument TVH Vial Number : 48 Sample Name : X05202;1;5 Injection Number: 1 Run Time Bar Code: Sequence Line Acquired on : 16 Apr 95 03:20 PM Instrument Method: TVH1BAS. M Report Created on: 16 Apr 95 09:55 PM Analysis Method : TVH0415.MT Last Recalib on : 16 APR 95 02:01 PM Sample Amount : 0 Multiplier ISTD Amount Sample Info : PROJECT # 95-1073 CLIENT # MD75-MW15 WATER

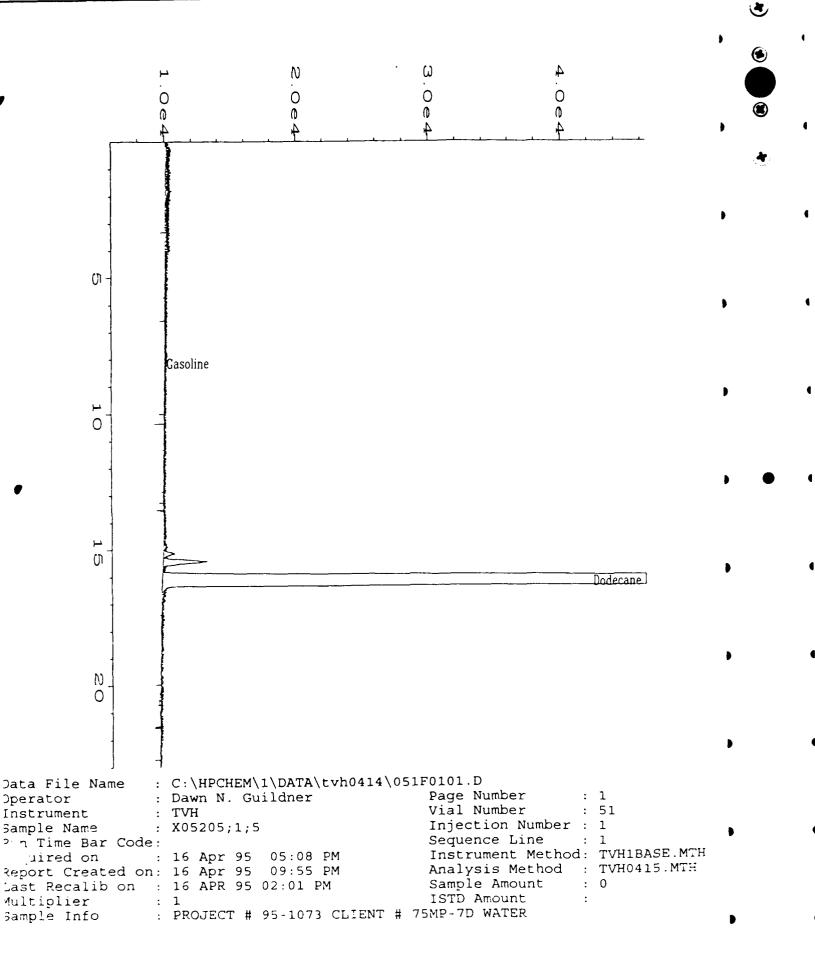


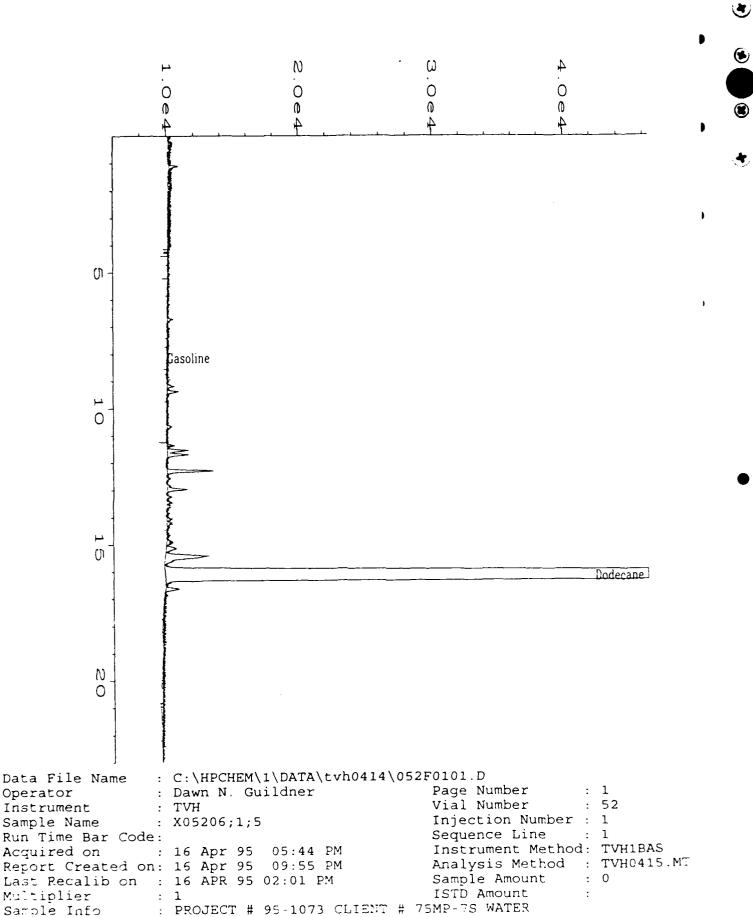
: PROJECT # 95-1073 CLIENT # 75MP-3D WATER

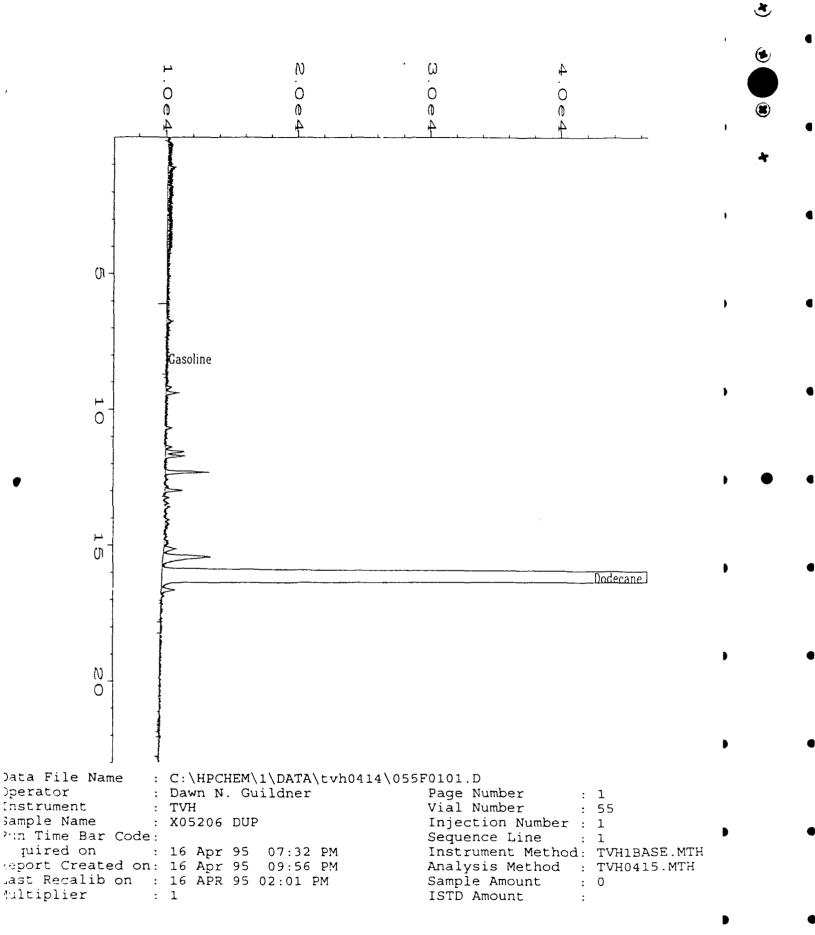
Sample Info

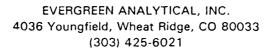


Operator Vial Number : TVH : 50 Instrument Injection Number: 1 Sample Name : X05204;1;5 Sequence Line : 1 Run Time Bar Code: Instrument Method: TVH1BA. Acquired on : 16 Apr 95 04:32 PM Analysis Method : TVH0415.M Report Created on: 16 Apr 95 09:55 PM Sample Amount Last Recalib on : 16 APR 95 02:01 PM : 0 ISTD Amount Multiplier : PROJECT # 95-1073 CLIENT # MD75-MW7 WATER Sample Info









TOTAL VOLATILE HYDROCARBONS (TVH) Laboratory Control Sample (LCS)

LCS Number

: LCS041595

Matrix

: WATER

Date Prepared

: 4/14/95

Method Number

: 5030/MOD.8015

Date Analyzed

: 4/15/95

Sequence Number

: TVH31

	Theoretical	LCS	LCS	
Compound	Concentration	Concentration	%	QC Limit
Name	mg/L	mg/ L	Recovery	% Recovery
Gasoline	5.90	6.02	120%	70%-130%

QUALIFIERS

U = TVH analyzed for but not detected.

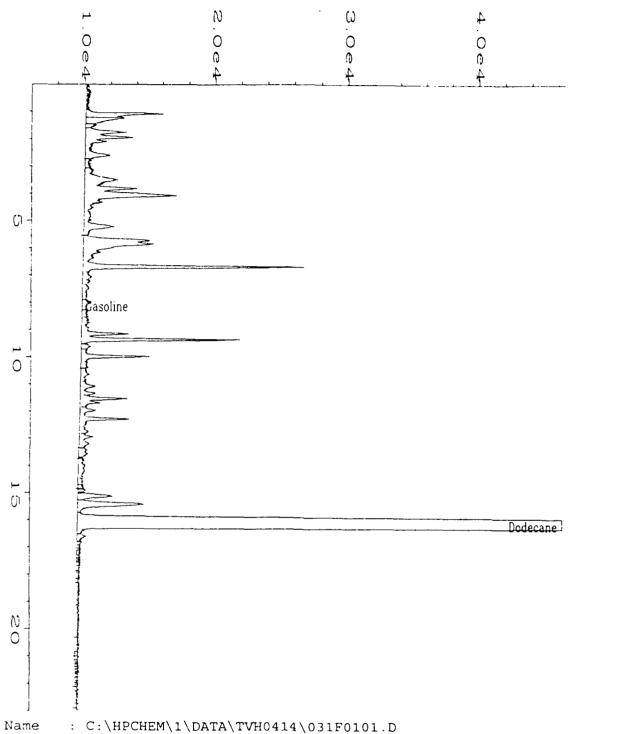
B = TVH found in blank as well as sample (blank data should be compared).

E = Extrapolated value.

NA = Not Available.

Analyst

Approved



Data File Name Operator : Dawn N. Guildner Page Number Instrument : TVH Vial Number : 31 Sample Name : LCS041595 Injection Number : 1 in Time Bar Code: Sequence Line : 1 quired on : 15 Apr 95 05:23 AM Instrument Method: TVH1BASE.MTH Report Created on: 25 Apr 95 01:42 PM Analysis Method : TVH0415.MTH Last Recalib on : 16 APR 95 02:01 PM Sample Amount Multiplier ISTD Amount

Miscellaneous Analyses

722450.21020

					122430.21020/
Date Sampled	:	4/2/95	Client Project ID.	:	MacDill AFB
Date Received	:	4/4/95	Lab Project No.	:	95-1073
Date Prepared	:	4/4/95	Detection Limit	:	0.250~mg/L
Date Analyzed	:	4/4/95	Method	:	EPA 300.0

Evergreen Sample #	Client <u>Sample ID</u>	<u>Matrix</u>	Chloride (mg/L)
X05205	75MP-7D	Water	28.4
X05205 Dup	75MP-7D dup	Water	28.8
X05206	75MP-7S	Water	16.0
X05208	MD75-MW15	Water	15.6
X05209	75MP-3D	Water	5.70
X05210	MD75-MW7	Water	22.2
Method blan	k (4/4/95)		<0.250

Quality Assurance

	True Value _(mg/L)	Result (mg/L)	% Recovery	
Alltech Anion Mixture A	20.0	19.5	97.5	

Analyst

Approved

1073tm 4

Miscellaneous Analyses

722450.21020/	7	2	2	4	5	0		2	1	0	2	0	/	
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Date Sampled	:	4/2/95	Client Project ID.	:	MacDill AFB
Date Received	:	4/4/95	Lab Project No.	:	95-1073
Date Prepared			Detection Limit	:	$0.076~{ m mg/L}$
Date Analyzed	:	4/4/95	Method	:	EPA 300.0

Evergreen <u>Sample</u> #	Client <u>Sample ID</u>	<u>Matrix</u>	Nitrite-N (mg/L)
X05205	75 M P-7D	Water	<0.076
X05205 Dup	75MP-7D dup	Water	<0.076
X05206	75MP-7S	Water	<0.076
X05208	MD75-MW15	Water	<0.076
X05209	75MP-3D	Water	<0.076
X05210	MD75-MW7	Water	<0.076
Method blan	k (4/4/95)		<0.076

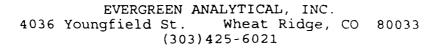
Quality Assurance**

	True Value (mg/L)	Result (mg/L)	% Recovery	
Alltech Anion Mixture A Lot #J-IONO1134	21.0	21.1	100	

** = Quality assurance results reported as Nitrite (NO₂)

analyst /

1073tm 4



Miscellaneous Analyses

722450.21020/

Date Sampled : 4/2/95 Client Project ID. : MacDill AFB
Date Received : 4/4/95 Lab Project No. : 95-1073
Date Prepared : 4/4/95 Detection Limit : 0.056 mg/L
Date Analyzed : 4/4/95 Method : EPA 300.0

Evergreen <u>Sample</u> #	Client <u>Sample ID</u>	<u>Matrix</u>	Nitrate-N (mg/L)
X05205	75MP-7D	Water	<0.056
X05205 Dup	75MP-7D dup	Water	<0.056
X05206	75MP-7S	Water	<0.056
X05208	MD75-MW15	Water	<0.056
X05209	75MP-3D	Water	<0.056
X05210	MD75-MW7	Water	<0.056
Method blank	(4/4/95)		<0.056

Quality Assurance**

	True Value	Result	%
	(mg/L)	(mg/L)	Recovery
Alltech Anion Mixture A Lot #J-IONO1134	20.0	18.2	91.0

** = Quality assurance results reported as Nitrate (NO₃)

Approved

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Miscellaneous Analyses

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			_		٦.	٦.		•	-	_	

Date Sampled	:	4/2/95	Client Project ID.	:	MacDill AFB
Date Received		• •	Lab Project No.	:	95-1073
Date Prepared			Detection Limit	:	0.250 mg/L
Date Analyzed	:	4/4/95	Method	:	EPA 300.0

Evergreen <u>Sample</u> #	Client <u>Sample ID</u>	<u>Matrix</u>	Sulfate (mg/L)
X05205	75MP-7D	Water	46.2
X05205 Dup	75MP-7D dup	Water	46.5
X05206	75MP-7S	Water	23.4
X05208	MD75-MW15	Water	40.2
X05209	75MP-3D	Water	11.5
X05210	MD75-MW7	Water	49.6
Method blank	(4/4/95)		<0.250

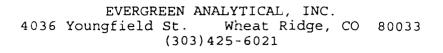
Quality Assurance

	True Value (mg/L)	Result (mg/L)	% <u>Recovery</u>
Alltech Anion Mixture A	30.0	29.5	98.3

Analyst

Approved

1073tm 4





Miscellaneous Analyses

722450-21020/	7	2	2	4	5	0	-	2	1	0	2	0	/	
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					122430 21020)
Date Sampled	:	4/2/95	Client Project ID.	:	MacDill AFB
Date Received	:	4/4/95	Lab Project No.	:	95-1073
Data Dranarad		1/5/05	Dotogtion Limit		E 00 macaco /I

Date Prepared : 4/5/95 Detection Limit : 5.00 mgCaCO₃/L Date Analyzed : 4/5/95 Method : EPA 310.1

Evergreen <u>Sample</u> #	Client <u>Sample ID</u>	<u>Matrix</u>	Total Alkalinity (mgCaCO ₃ /L)
X05202	MD75-MW15	Water	93.8
X05202 Dup	MD75-MW15 Dup	Water	96.1
X05204	MD75-MW7	Water	167
Method Bla	nk (4/5/95)		<5.00

Quality Assurance

	True Value	Result	%
	(mgCaCO ₃ /L)	(mgCaCO ₃ /L)	Recovery
APG Minerals Reference Lot # 13862	11.8	10.8	91.5

Approved

1973tm,4

Analyst By



CASE NARRATIVE

Evergreen Analytical Laboratory (EAL) Project #: 95-1063

Parsons Engineering Science, Inc. (PES) Project: MacDill AFB (722450.21020)

Sample Receipt

On April 1, 1995, twenty water samples and one trip blank were received in good condition at EAL with the following discrepancies: the samples arrived without a chain of custody. A copy of the chain of custody was faxed to EAL on April 3. Samples were received but not listed on the c.o.c. for MD24-26 TEPH, MD24-MW10A BTEX, MD24-MW10 BTEX, MD24-MW2 MS/MSD TEPH. These samples were analyzed as listed on the bottles per instruction from John Hicks of PES.

Refer to the EAL Sample Log Sheet for specific log-in information and cross-reference of EAL and PES sample identifications.

BTEX, Water Matrix, Method E602

Samples MD75-MW3, MD75-MW14 and MD75-MW4 were analyzed within holding time with low surrogate recovery. The samples were re-run outside holding time with surrogate recoveries within EAL control limits. The original data are reported.

Samples MD75-MW8, MD75-MW14, 75MP-4S, MD75-MW4 and MD75-MW24 were also analyzed within holding times, but due to the presence of target compounds beyond linear range, required dilutions. These dilutions were performed outside of holding times. The original data are reported with extrapolated values for compounds out of the linear range of the instrument. The external standard reports and chromatograms for the diluted analyses are included.

Total Volatile Hydrocarbons (TVH), Water Matrix, Method 8015M
The relative percent difference (RPD) for the MS/MSD percent recoveries was outside the EAL control criteria. Please refer to the Laboratory Control Sample for acceptable spike recovery data. There were no other quality control anomalies to report.

Total Extractable Hydrocarbons (TEH), Water Matrix, Method 8015M One sample was submitted labeled MS/MSD for TEH analysis and was not associated with a normal sample. Due to a laboratory error, the sample was prepped without spiking. The MS/MSD sample was analyzed as a normal sample. John Hicks of PES was notified on April 4, 1995.

Page Two Case Narrative Parsons Engineering Science

Samples 24MP-2S, MS24-MW6, MD24-MW2, MD24-MW26 and MS/MSD exhibited surrogate recoveries below the EAL control limits. The samples were injected a second time with similar recoveries, verifying that the results are not an instrument problem. The re-injected results are reported with an "R" qualifier. Samples should have been re-extracted but were not due to insufficient sample volume.

<u>General Chemistry</u>
There were no quality control anomalies to report.

Patricia A. McClellan, Project Manager

Project # <u>95-1063</u> **Evergreen Analytical Sample Log Sheet** Date Due: 4/06/95-UST Date(s) Sampled: 3/31/95 COC 4/17/95-OTHERS Holding Time(s): 4/02-NO2, NO3 _ate Received: 4/01/95 4/14-BTEX, TVH Client Project I.D. 722450.21020/MAC DILL Rush STANDARD Client: PARSONS ENGINEERING SCIENCE Shipping Charges N/A Address: 1700 BROADWAY, SUITE 900 E.A. Cooler # 501 DENVER, CO. 80210 Airbill # H/D Contact: TODD WIEDEMEIER Custody Seal Intact? Cooler N/A Bottles N/A Client P.O. COC Present Sample Tags Present? Y Phone #831-8100 Fax #831-8208 Sample Tags Listed? Y Y Sample(s) Sealed? Special Instructions ALL BTEX AND VOA SAMPLES ARE TO INCLUDE CHLOROBENZENE, TMB AND TEMB UNLESS OTHERWISE NOTED. AN MS/MSD AND LAB DUPLICATE IS TO BE ANALYZED ON THIS CLIENT'S PROJECT. MS/MSD WILL BE REQUIRED FOR BTEX ONLY ON THIS PROJECT. Client Mtx Btl Analysis Loc ID# BTEX W 40V 2 X05167A/B MD75-MW16 W 40V X05168A/B 75MP-2S BTEX 2 X05169A/B MD75-MW12 BTEX W 40V X05170A TRIP BLANK BTEX W 40V W 40V X05171A/B MD75-MW3 BTEX W 40V 2 X05172A/B MD75-MW8 BTEX W 40V 2 X05173A/B MD75-MW14 BTEX W 2 X05174A/B 75MP-4S BTEX 40V W X05175A/B MD75-MW4 BTEX 40V W 40V X05176A/B MD75-MW24 BTEX W 40V 2 X05177A/B MD75-MW6 BTEX W 2 40V X05179A/B MD24-MW6 BTEX BTEX W 40V 2 X05180A/B MD24-MW6A W X05181A FIELD BLANK 40V 2 BTEX *Samples to be returned SxPrep 1 Trute GC/MS GC 2_ Metals ___ Wet Chem 2 SxRec _2 File Adm1 X Adm2 Χ Sales X Acctq X Х QA/QC Custodian/Date: 80 4/4/95 Page 1 of 3 Page(s)

Lab ID #	Client ID#	Analysis	. Mtx	Btl	Loc
X05182A	RINSEATE BLANK	BTEX	W	40V	2
X05186A/B	MD24-MW10A	BTEX	W	40V	22
X05187A/B	MD24-MW10	BTEX	w	40V	22
X05167C/D	MD75-MW16	TVPH	W	4 O V	22
X05168C/D	75MP-2S	TVPH	W	4 0 V	2
X05169C/D	MD75-MW12	TVPH	W	40V	2
X05171C/D	MD75-MW3	TVPH	W	40V	2
X05172C/D	MD75-MW8	TVPH	W	40V	2
X05173C/D	MD75-MW14	TVPH	W	40V	2
X05174C/D	75MP-4S	TVPH	W	40V	2
X05175C/D	MD75-MW4	TVPH	w	40V	2
X05176C/D	MD75-MW24	TVPH	w	40V	2
X05177C/D	MD75-MW6	TVPH	w	40V	2
X05169E	MD75-MW12	ТЕРН	w	1LA	C2
X05172E	MD75-MW8	ТЕРН	w	1LA	C2
X05175E	MD75-MW4	ТЕРН	w	1LA	C2
X05178E	24MP-2S	ТЕРН	W	1LA	C2
X05179E	MD24-MW6	ТЕРН	W	1LA	C2
X05183E	MD24-MW2	ТЕРН	W	1LA_	C2
X05184E	MD24-26	TEPH	W	1LA	C2
X05185E	MD24-MW2 MS/MSD	ТЕРН	W	1LA	C2
X05167E	MD75-MW16	ANIONS	W	125P	C2
X05168E	75MP-2S	ANIONS	W	125P	C2
X05169F	MD75-MW12	ANIONS	W	125P	C2
X05171E	MD75-MW3	ANIONS	W	125P	C2
X05172F	MD75-MW8	ANIONS	W	125P	C2
X05173E	MD75-MW14	ANIONS	W	125P	C2
X05174E	75MP-4S	ANIONS	W	125P	C2
X05175F	MD75-MW4	ANIONS	W	125P	C2
X05176E	MD75-MW24	ANIONS	<u> </u>	125P	C2
X05177E	MD75-MW6	ANIONS	W	125P	C2
X05169G	MD75-MW12	ALKALINITY	W	250P	C2
X05171F	MD75-MW3	ALKALINITY	W	250P	C2

Page 2 of 3

PROJECT #1063

Lab ID	Client ID	ANALYSIS	MATRIX	BOTTLE	LOC
,5172G	MD75-MW-8	ALKALINITY	W	250P	C2
05175G	MD75-MW-4	ALKALINITY	W	250P	C2
05176F	MD75-MW-24	ALKALINITY	W	250P	C2
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Page 3 of 3

PROJECT #1063

CHAIN	OF CUSTO	CHAIN OF CUSTODY RECORD / ANALYTICAL SERVICES REQUEST	CES REQUEST	
MANNE PER E APP. BOX 188 601 AL. De one C	مراد و مود و مراد	Evergreen Analytical Inc.)	Page 1, 01 2
DAFSS 170 Bireline Sol	1. 50C.	Wheat Rage, Colorado 80033 (303) 425-6021	PROJECT ID TELYSO-1102C	11.02C
OFFICE AND A CONTRACTOR	0 1 2	(800) 845-7400	EAL QUOTE #	104
	FAX	FAX RESULTS Y ! N	TURNAROUND REQUIRED. 30 0 1215	2 miles
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10 THEE . LESSELY	MATRIX	ANALYSIS REQUESTED	TED	EAL USB ONLY
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EAL USB ONLY DO not made	In shades area Project a DOQ	XOS (64)	30)	60)	95	/ £	75	73	*	75	76	Location A C	Container Size	
ANALYSIS REQUESTED	CUCIE & S. S. Medials Dellow) 1012 Medials DW / Wedde 1012 Medials DW	X X	×	× × ×	×	X	×××××××××××××××××××××××××××××××××××××××	×	×	×××	× × ×			
MATRIX	PCB Scroon TOLL VOA:BNA/Pest/Merais BNA 6270/625 (CICCIO) BNA 6270/625 (CICCIO) BNA 6270/625 (CICCIO) COM 6250/624/524 S (CICCIO) COM 6250/624/524 S (CICCIO) DOSUPPRINTED VOA:BNA/Pest/Merais Soul : Solid		X				X			×	У.			in TCE
Ž [No. ci Containera Waler-Urinking-Urischarge/E/02/20	>	X	X	ı	×	V,		>	7	X			-4
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CHAIN OF CUSTODY RECORD / ANALYTICAL SERVICES REQUEST

County C	CLIENT CONTACT (pent) PHOJECT I.D. 7 2 7 - EAL. QUOTE # TURNAROUTE REQUIRED*	expedible unalound subject to			XDS147	84	04	22		23	4	58	200	101		
CATE CONTINUES	033	, exped	91818 DEION 2M846 1818 - DM / 2M846 1818 DM / 2M86 1818 DM / 2M866 1818 DM /	Toricio & list mail	×	×	 X			X	×				1	
STATE C 210 5 210 STATE C 210	Amalytical Inc 4006 Youngheld St Wheat Ridge, Colorado B (303) 425-6021 FAX (303) 425-6654 (800) 845-7400 - 	ANALYSIS	S (circle) MTBE (circle)	PCB Scienn	×		×	×>	(x				*			
PRINT SANTECO 20 GC 210 STATE CO 20 GC 210 STATE CO 20 GC 210 SANTECO 20 GC 210 CATE CATE CATE CATE SAN OLES CONTAINED SAN OLES CONTAINE	////		4/524.2 (CIrcle)	BNA 8270/62												1000
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*

Evergreen Analytical Sample Recei	
Date & Time Rec'd: 4/1/95 1000 Shipp	ped Via:
client: Parsons	
Client Project ID(s): 122450	<u> - 21020 </u>
EAL Project $\#(s):95-10(c)$	EAL Cooler(s): Y
Cooler# 501	
Ice packs Y N Y N Y N	y n y n
Temperature °C	
	Y N N/A
1. Custody seal(s) present: Seals on cooler intact Seals on bottle intact	
2. Chain of Custody present:	XXII
Seals on bottle intact 2. Chain of Custody present: 3. Containers broken or leaking: (Comment on COC if Y)	ù pm
4. Containers labeled:	
5. COC agrees w/ bottles received: (Comment on COC if N)	
6. COC agrees w/ labels: (Comment on COC if N)	
Headspace in VOA vials-waters only (comment on COC if Y)	
3. VOA samples preserved:	
 pH measured on metals, cyanide or phenolical phase ph	
.0. Metal samples present: Total, Dissolved D or PD to be filtered: T,TR,D,PD to be Preserved:	
1. Short holding times: Specify parameters	
2. Multi-phase sample(s) present:	
3. COC signed w/ date/time:	
omments:	

CHAIN UP CUSIOUT HECORD / ANALYTICAL SERVICES REQUEST

SHITE 80 Summe 80270 COMPANY (CV) . P. L. FESSIMECING ZIP ADDRESS / 20 Brise during PHONE# 303-831-8/00 CITY DLAVE STATE (O

4036 Youngfield St. Wheat Ridge, Colorado 80033 Evergreen Analytical Inc. (303) 425-6021 FAX (303) 425-6854 (800) 845-7400

Wedemaner 07012-031226 245 P *expedited turnaround subject to additional fee PO.# black TURNAROUND REQUIRED. CLIENT CONTACT (print)__ EAL. QUOTE # PROJECT I D.

Do not write in shaded area EAL use only

ANALYSIS REQUESTED $_{\sim}$

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FAX RESULTS Y /

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FAX #

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JESSELY (Signature) 174 Print MARK Cooler Received_

PIERSE PRINT

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In shaded area EAL Project # Custodian EAL Sample No			٠								Location	Container Size		0 x 0 56-1-6
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(EP) 8015mod (Diesel) Joial Metals-DW / NPDES / SW846 (Circle & list metals below)	$oldsymbol{ol}}}}}}}}}}}}}}}}}$													
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TRPH 418 1/0/1 & Grease 413	Į.						_					_		
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Date/Time Relinquished by. (Signature)

Date/Time Received by (Signature)

8

Date Time

CHAIN OF CUSTODY RECORD / ANALYTICAL SERVICES REQUEST

c		(71	Evergreen Analytical Inc.	een f	Inaly	ntical	Inc.							rage or
COMPANY TWEENS ENGINEERS	Engineer chy	51.12	7			· //	\$ ¥ §	4036 Youngfield St. Wheat Ridge, Colorado 80033	glield St	rado 80(033	ป :	ENT CO	CLIENT CONTACT (print)	1	Todd	Wie demein
3:27	STATE CO ZIP	7) 2		'\	//	3 X 8	(303) 425-6021 FAX (303) 425-6854 (800) 845-7400	3021 425-685 7400	4		E P	PROJECT I.D., EAL. QUOTE #	о щ ш	7	24500	PO#
	0018-158-100	FAX #					F.	FAX RESULTS		z ` ≻		2	RNARO	JND REC	TURNAROUND REQUIRED:	30	days
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MARK	VESSELY	1 1	MA	MATRIX				₹	ANALYSIS		REQUESTED	ESTE	a				EAL use only Do not write
Evergreen Analytical Cuoter No Cooler Received all information. CLIENT SAMPLE SAMPLE DAT IDENTIFICATION SAMP MO24 - MW C 3/31 WVD27 - MW C 3/31 WVD27 - MW C 3/31 WVD27 - MW C 3/31 EVENT SAMP MO24 - MW C 3/31 MO24 - MW C 3/31 EVENT SAMP	INT ion: DATE AMPLED 3/3:/45 3/3:/45 3/3:/45 (21/17/45 (21/17/45)	17. 17. 17. 17. 17. 18. 18. 19. of Containers	Soil / Solid Soil / Solid Soil / Solid Soil / Solid Soil / Solid	egbui2 / IIO	TCLP VOA/BNA/Pest/Herb/Metals VOA 8260/624/524.2 (circle) BNA 8270/62	BNA 8270/625 (circle) Peslicides 8080/608 (circle) Peslicides 8080/608 (circle)	37609/0808 SP2 100	PCB Screen	TAPH 418 T/O ₂ (circle)/MTBE (circle)	TVPH 8015mod (Greek)	Total Meial Meial (Diesel)	Dissolved Metals Delow) (circle & list metals Delow) (wold a list metals Delow) (wold a list metals Delow) (wold a list metals Delow)	S Har W				EAL: Project # Custodian. EAL Sample No.
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with Against Salan	_	Date/Time Received by (Signature)	ØS) ∧q	nature)	-	Date	Date/Time nquished by (Signature)	sinbuis	hed by	neuta;)	(ar	-	Date/Tin	ne Reco	sived by:	Date/Time Received by: (Signature)	, Date Time

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Method 602 Data Report

Client Sample Number	: 75MD-2S	Client Project No.	: 722450.21020/Mac Dill
Lab Sample Number	: X05168	Lab Project No.	: 95-1063
Date Sampled	: 3/31/95	Dilution Factor	: 1.00
Date Received	: 4/1/95	Method	: 602
Date Prepared	: 4/13/95	Matrix	: Water
Date Analyzed	: 4/14/95	Lab File No.	: BX1041320
		Method Blank No.	: MB041395

		Sample	
Compound Name	Cas Number	Concentration	RL
		ug/L	ug/L
Benzene	71-43-2	13	0.4
Toluene	108-88-3	••	••
Chlorobenzene	108-90-7	U	0.4
Ethyl Benzene	100-41-4	50	0.4
Total Xylenes	108-38-3, 106-42-3	88	0.4
(m, p & o)	and 95-47-6		
1,3,5-Trimethylbenzene	108-67-8	**	* *
1,2,4-Trimethylbenzene	95-63-6	• •	**
1,2,3-Trimethylbenzene	526-73-8	••	••
1,2,3,4-Tetramethylbenzene	488-23-3	••	••
Surrogate Recovery (α,α,α-Trifluo	rotoluene):	70%	70%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

** = See BX1041356 (DF = 10).

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

B = Compound also found in the blank.

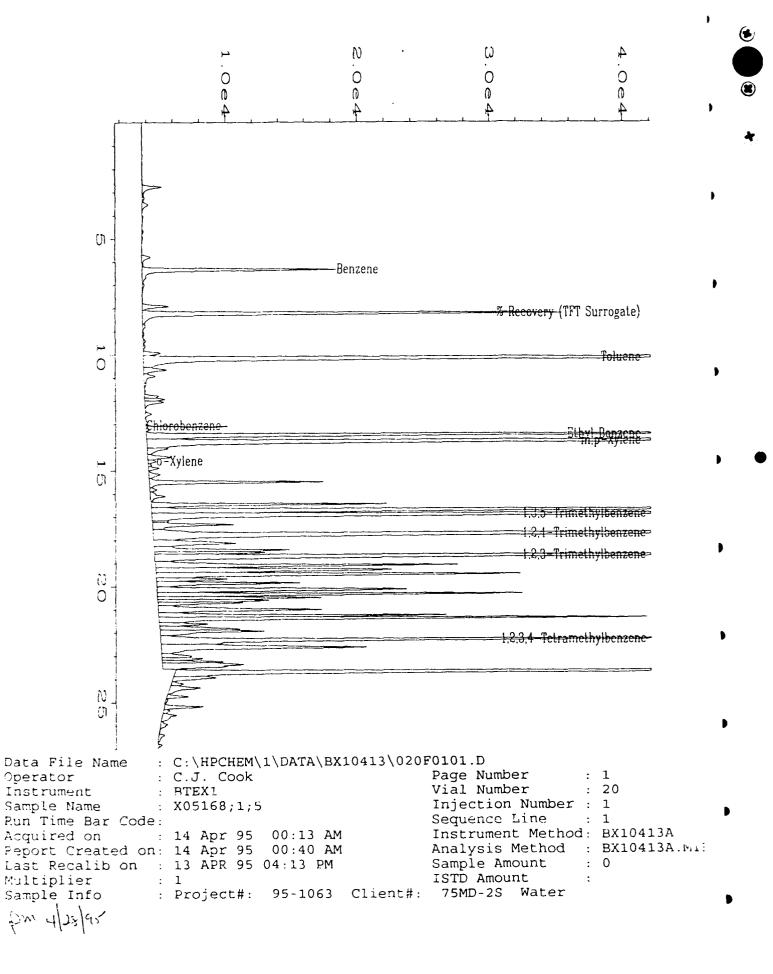
RL = Reporting Limit.

NA = Not Available/Not Applicable.

Analyst

Approved

BTEX1063 XLS



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Method 602 Data Report

Client Sample Number	: 75MD-2S	Client Project No.	: 722450.21020/Mac Dill
Lab Sample Number	: X05168	Lab Project No.	: 95-1063
Date Sampled	: 3/31/95	Dilution Factor	: 10.00
Date Received	: 4/1/95	Method	: 602
Date Prepared	: 4/14/95	Matrix	: Water
Date Analyzed	: 4/14/95	Lab File No.	: BX1041356
		Method Blank No.	: MB041495

•		Sample	
Compound Name	Cas Number	Concentration	RL
		ug/L	ug/L
Benzene	71-43-2	**	* *
Toluene	108-88-3	82	4.0
Chlorobenzene	108-90-7	**	**
Ethyl Benzene	100-41-4	**	**
Total Xylenes	108-38-3, 106-42-3	**	**
(m, p & o)	and 95-47-6		
,3,5-Trimethylbenzene	108-67-8	70	4.0
1,2,4-Trimethylbenzene	95-63-6	140	4.0
1,2,3-Trimethylbenzene	526-73-8	110	4.0
1,2,3,4-Tetramethylbenzene	488-23-3	66	**
Surrogate Recovery (α,α,α-Trifluo	rotoluene):	70%	70%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

** = See BX1041320.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

B = Compound also found in the blank.

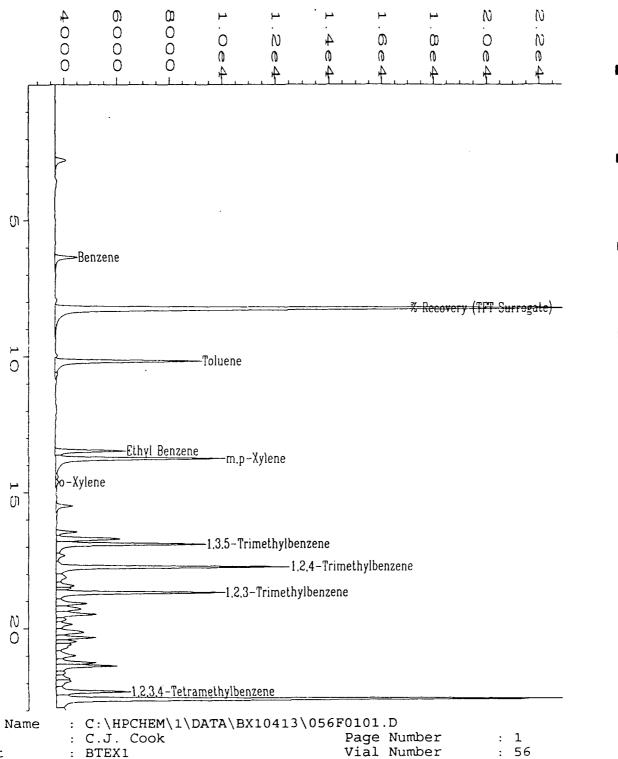
RL = Reporting Limit.

NA = Not Available/Not Applicable.

Analyst

Approved

BTEX1063.XLS



Data File Name Operator Instrument Injection Number: 1 : X05168;10;500ul Sample Name Sequence Line Run Time Bar Code: : 14 Apr 95 Instrument Method: BX10414 Acquired on 11:59 PM : BX10414B.M Report Created on: 27 Apr 95 07:36 PM Analysis Method Sample Amount Last Recalib on : 15 APR 95 01:55 PM : 0 ISTD Amount Multiplier : 10 Water

Sample Info : Project#: 95-1063 Client#: 75MD-2S



Method 602 Data Report

Client Sample Number : 75MP-4S Client Project No. : 722450.21020/Mac Dill Lab Sample Number : X05174 Lab Project No. : 95-1063 Date Sampled Dilution Factor : 1.00 : 3/31/95 **Date Received** Method : 602 : 4/1/95 Date Prepared : 4/13/95 Matrix : Water Date Analyzed : 4/14/95 Lab File No. : BX1041326 Method Blank No. : MB041395

Compound Name	Cas Number	Sample Concentration ug/L	RL ug/L
Benzene	71-43-2	50	0.4
Toluene	198-88-3	36	0.4
Chlorobenzene	108-90-7	3.5	0.4
Ethyl Benzene	100-41-4	>60 **	0.4
Total Xylenes (m, p & o)	108-38-3, 106-42-3 and 95-47-6	43	0.4
1,3,5-Trimethylbenzene	108-67-8	12	0.4
1,2,4-Trimethylbenzene	95-63-6	41	0.4
1,2,3-Trimethylbenzene	526-73-8	41	0.4
1,2,3,4-Tetramethylbenzene	488-23-3	>60 **	0.4
Surrogate Recovery (a,a,a-Trifluo	rotoluene):	71%	70%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected. .

B = Compound also found in the blank.

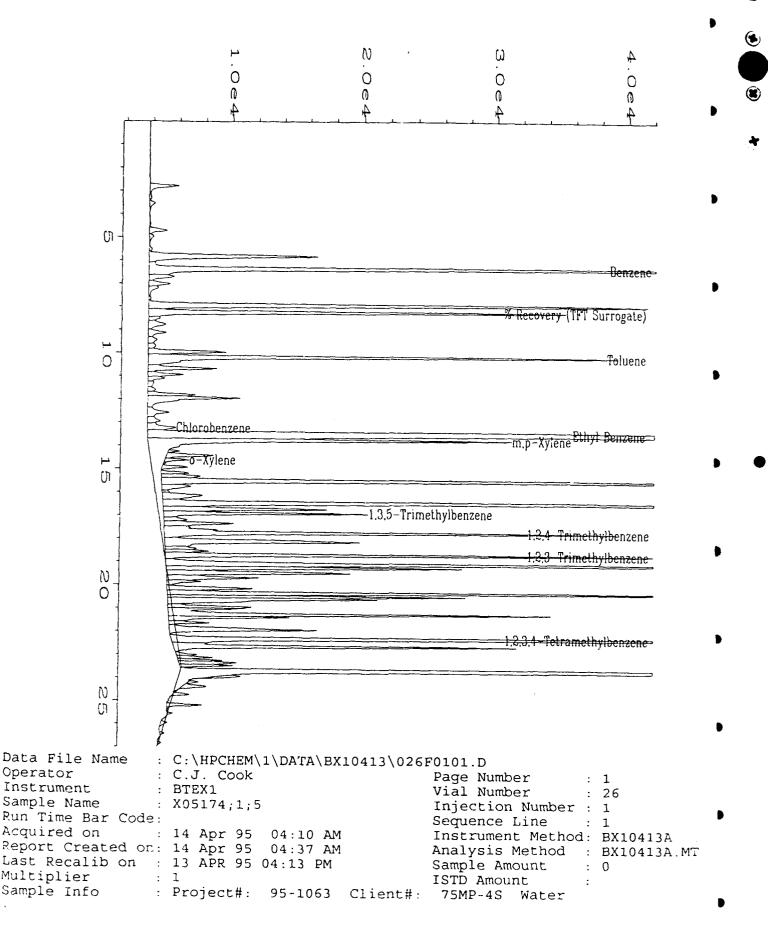
RL = Reporting Limit.

NA = Not Available/Not Applicable.

Approved

BTEX1063.XLS

^{** =} Greater than 10% of calibration range. See BX1041716 (DF = 20) run past holding time.



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Method 602 Data Report

Client Sample Number	: 75MP-45	Client Project No.	: 722450.21020/Mac Dill
Lab Sample Number	: X05174	Lab Project No.	: 95-1063
Date Sampled	: 3/31/95	Dilution Factor	: 20.00
Date Received	: 4/1/95	Method	: ∂02
Date Prepared	: 4/17/95	Matrix	: Water
Date Analyzed	: 4/17/95	Lab File No.	: BX1041716
		Method Blank No.	: MB041795

	Sample					
Compound Name	Cas Number	Concentration	RL			
		ug/L	ug/L			
Benzene	71-43-2	**	8.0			
Toluene	108-88-3	**	8.0			
Chlorobenzene	108-90-7	**	8.0			
Ethyl Benzene	100-41-4	460.0*	8.0			
Total Xylenes	108-38-3, 106-42-3	••	8.0			
(m, p & o)	and 95-47-6					
3,5-Trimethylbenzene	108-67-8	••	8.0			
1,2,4-Trimethylbenzene	95-63-6	**	8.0			
1,2,3-Trimethylbenzene	526-73-8	**	8.0			
1,2,3,4-Tetramethylbenzene	488-23-3	78.0*	8.0			
Surrogate Recovery (α,α,α-Trifluo	rotoluene):	82%	70%-130% (QC limits)			

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

B = Compound also found in the blank.

RL = Reporting Limit.

NA = Not Available/Not Applicable.

Approved

BTEX1063.XLS

^{* =} Holding Time Surpassed.

^{** =} See BX1041326.

External Standard Report

Data File Name : C:\HPCHEM\1\DATA\BX10417\016F1001.D

Operator : C.J. Cook Page Number : Instrument : BTEX1 ... Vial Number :

Sample Name : X05174(20;0.250 Injection Number : 1
Run Time Bar Code: Sequence Line : 10

Acquired on : 17 Apr 95 03:51 PM Instrument Method: BX10417A.N Report Created on: 17 Apr 95 07:28 PM Analysis Method : BX10417B.N

Last Recalib on : 17 APR 95 07:07 PM Sample Amount : 0 Multiplier : 20 ISTD Amount :

Sample Info : Project#: 95-1063 Client#: 75MP-45 Water

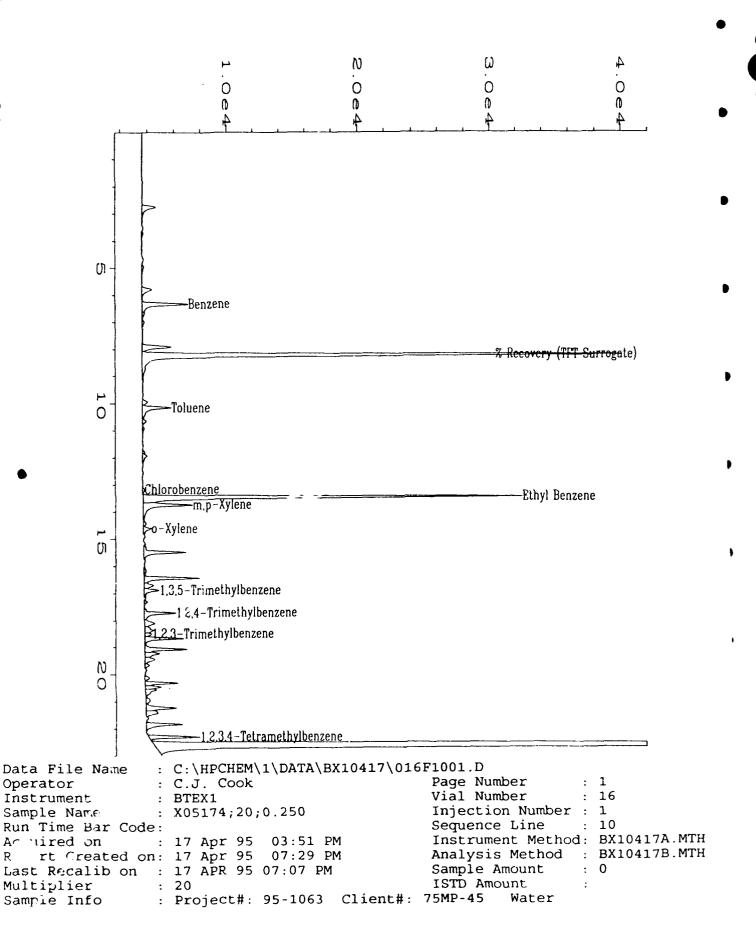
Sig. 1 in $C:\HPCHEM\1\DATA\BX10417\016F1001.D$

Ret Time	Area		Width		ug/L	Name	ı
				-			
6.330	24882	VV	0.107	1	53.885	Benzene	
8.213	252850	VV	0.106	1-R	1644.939	% Recovery (TFT Surrogate) \$72,	
10.151	16893	VV	0.114	1	39.647	Toluene	
13.169	1325	VV	0.151	1	3.616	Chlorobenzene	ļ
13.456	165067	VV	0.088	1	459.579	_Ethyl Benzene	
13.738	29452	VV	0.115	1	66.467	m,p-Xylene	
14.606	4565	VV	0.114	1	11.847	o-Xylene	
16.889	7670	VV	0.102	1	17.154	1,3,5-Trimethylbenzene	
17.726	15398	VV	0.096	1	47.038	1,2,4-Trimethylbenzene	
18.503	2959	VV	0.087	1	9.089	1,2,3-Trimethylbenzene	
22.302	19127	PV	0.079	1	78.479	1,2,3,4-Tetramethylbenzene	

Time Reference Peak Expected RT Actual RT Difference 2 8.275 8.213 -0.062

Holding Time
Np

not week



Method 602 Data Report

Client Sample Number	: MD75-MW3	Client Project No.	: 722450.21020/Mac D
Lab Sample Number	: X05171	Lab Project No.	: 95-1063
Date Sampled	: 3/31/95	Dilution Factor	: 1.00
Date Received	: 4/1/95	Method	: 602
Date Prepared	: 4/14/95	Matrix	: Water
Date Analyzed	: 4/14/95	Lab File No.	: BX1041323
		Method Blank No.	: MB041395

		Sample		
Compound Name	Cas Number	Concentration	RL	
		ug/L	ug/L	
Benzene	71-43-2	U	0.4	
Toluene	108-88-3	U	0.4	
Chlorobenzene	108-90-7	U	0.4	
Ethyl Benzene	100-41-4	U	0.4	
Total Xylenes	108-38-3, 106-42-3	υ	0.4	
(m, p & o)	and 95- 47 -6			
1,3,5-Trimethylbenzene	108-67-8	U	0.4	
1,2,4-Trimethylbenzene	95-63-6	υ	0.4	
1,2,3-Trimethylbenzene	526-73-8	U	0.4	
1,2,3,4-Tetramethylbenzene	488-23-3	U	0.4	

69% *

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

* = Out of limit. See BX1041358 (DF = 1) run past holding time.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

Surrogate Recovery (\alpha, \alpha, \alpha - Trifluorotoluene):

B = Compound also found in the blank.

RL = Reporting Limit.

NA = Not Available/Not Applicable.

Approved

70%-130% (QC limits)

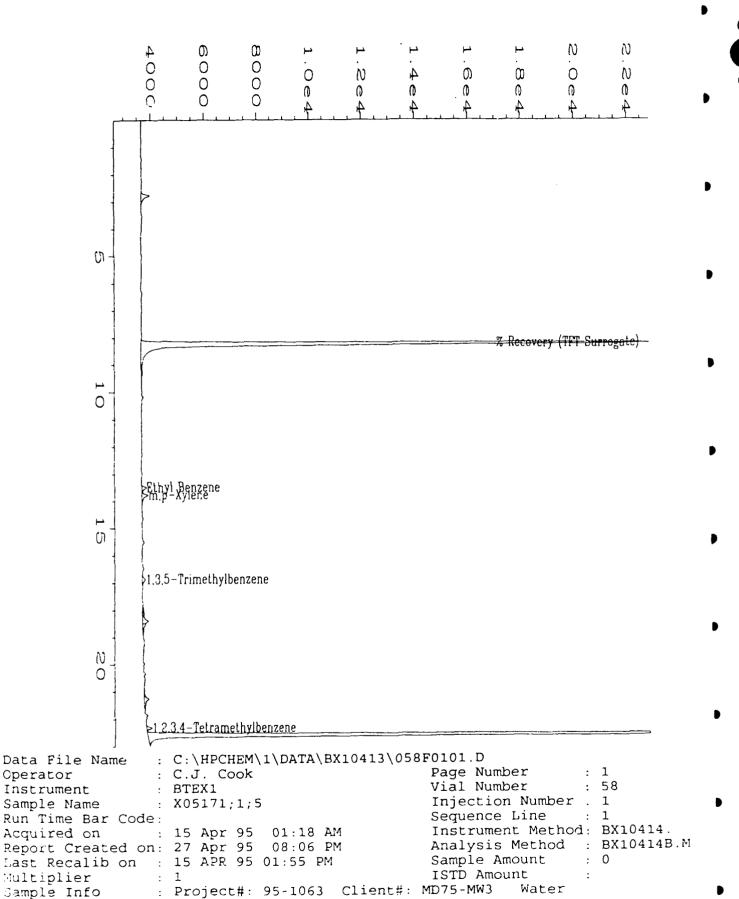
BTEX1063.XLS

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                                                                  <del>-% Reco</del>very (TFT Surrogate)
                  Toluene
            0
            O
                  1.35 Trimethylbenzene
                  1,2,4-Trimethylbenzene
            N
            0
                  1<del>.2.3.4 - Tetramethylbenzene</del>
            N
            U
Data File Name
                    : C:\HPCHEM\1\DATA\BX10413\023F0101.D
Operator
                    : C.J. Cook
                                                         Page Number
Instrument
                    : BTEX1
                                                         Vial Number
Sample Name
                    : X05171;1;5
                                                         Injection Number: 1
Pun Time Bar Code:
                                                         Sequence Line
ired on : 14 Apr 95 02:11 AM Report Created on: 14 Apr 95 02:39 AM
                                                         Instrument Method: BX10413A.MTH
                                                         Analysis Method : BX10413A.MTH
Last Recalib on : 13 APR 95 04:13 PM
                                                         Sample Amount
Aultiplier
                                                         ISTD Amount
Sample Info
                    : Project#: 95-1063 Client#: MD75-MW3 Water
    Dm 4/28/95
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Method 602 Data Report

Client Sample Number : MD75-MW4 Client Project No. : 722450.21020/Mac Dill : X05175 Lab Project No. : 95-1063 Lab Sample Number Date Sampled : 3/31/95 Dilution Factor : 1.00 **Date Received** : 4/1/95 Method : 602 **Date Prepared** : 4/13/95 Matrix : Water Lab File No. : BX1041327 **Date Analyzed** : 4/14/95 Method Blank No. : MB041395

	Sample				
Compound Name	Cas Number	Concentration	RL		
		ug/L	ug/L		
Benzene	71-43-2	>60 ••	0.4		
Toluene	108-88-3	2.2	0.4		
Chlorobenzene	108-90-7	2.2	0.4		
Ethyl Benzene	100-41-4	>60 **	0.4		
Total Xylenes	108-38-3, 106-42-3	U	0.4		
(m, p & o)	and 95-47-6				
1,3,5-Trimethylbenzene	108-67-8	U	0.4		
1,2,4-Trimethylbenzene	95-63-6	2.1	0.4		
1,2,3-Trimethylbenzene	526-73-8	0.8	0.4		
1,2,3,4-Tetramethylbenzene	488-23-3	>60 **	0.4		
Surrogate Recovery (α,α,α-Trifluc	rotoluene):	69%*	70%-130% (QC limits)		

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

B = Compound also found in the blank.

RL = Reporting Limit.

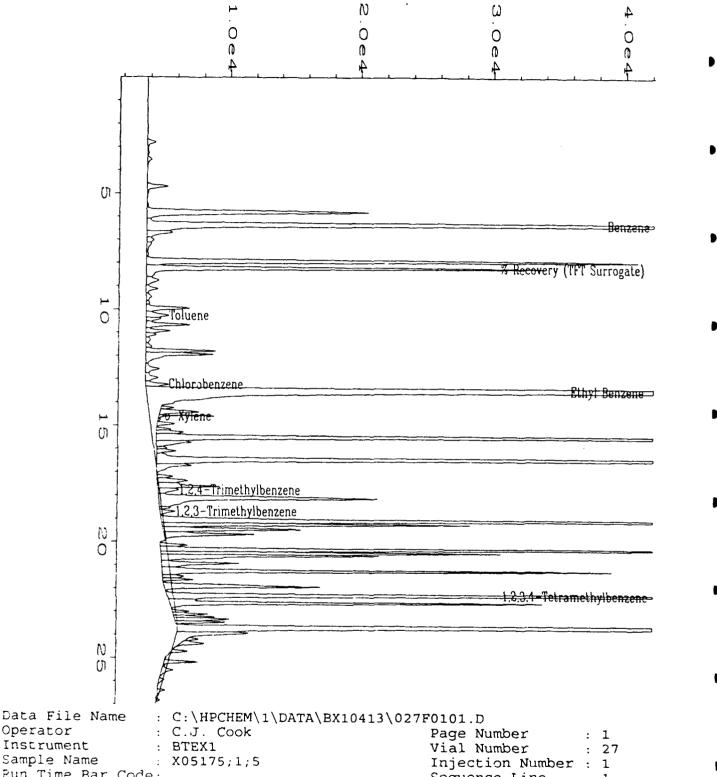
NA = Not Available/Not Applicable.

Approved

B1EX1063 XU.)

^{* =} Out of limit.

^{** =} Greater than 10% of the calibration range. See BX1041717 (DF = 20) run past holding time.



Sample Name Run Time Bar Code: Sequence Line : 1 Acquired on : 14 Apr 95 04:49 AM Instrument Method: BX10413A. ... Report Created on: 14 Apr 95 05:17 AM Analysis Method : BX10413A.MT Last Recalib on · 13 APR 95 04:13 PM Sample Amount Multiplier ISTD Amount Sample Info 95-1063 Client#: MD75-MW4 Water : Project#: Dm 4/18/95

Operator

Method 602 Data Report

: MD75-MW4	Client Project No.	: 722450.21020/Mac Dill
: X05175Dup	Lab Project No.	: 95-1063
: 3/31/95	Dilution Factor	: 5.00
: 4/1/95	Method	: 602
: 4/13/95	Matrix	: ·Water
: 4/14/95	Lab File No.	: BX1041328
	Method Blank No.	: MB041395
	: X05175Dup : 3/31/95 : 4/1/95 : 4/13/95	: X05175Dup Lab Project No. : 3/31/95 Dilution Factor : 4/1/95 Method : 4/13/95 Matrix : 4/14/95 Lab File No.

Compound Name	Cas Number	Sample Concentration ug/L	RL ug/L
Benzene	71-43-2	>60 **	0.4
Toluene	108-88-3	1.9	0.4
Chlorobenzene	108-90-7	2.0	0.4
Ethyl Benzene	100-41-4	>60 **	0.4
Total Xylenes (m, p & o)	108-38-3, 106-42-3 and 95-47-6	U	0.4
#,3,5-Trimethylbenzene	108-67-8	U	0.4
1,2,4-Trimethylbenzene	95-63-6	1.9	0.4
1,2,3-Trimethylbenzene	526-73-8	1.0	0.4
1,2,3,4-Tetramethylbenzene	488-23-3	>60 **	0.4
Surrogate Recovery (α,α,α-Trifluc	protoluene):	63% *	70%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

B = Compound also found in the blank.

RL = Reporting Limit.

NA = Not Available/Not Applicable.

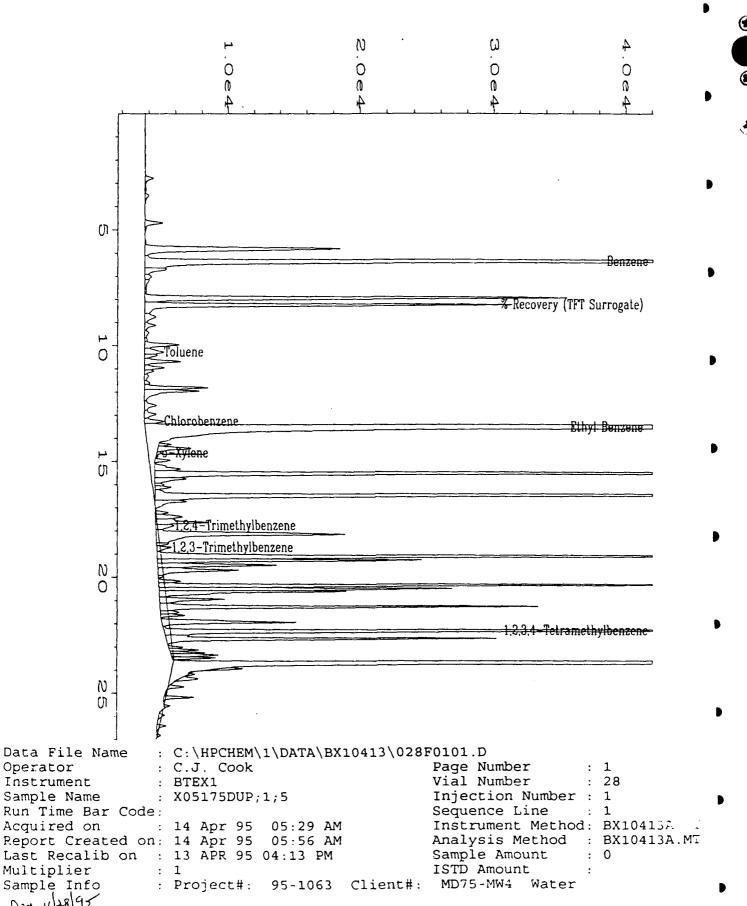
Analyst

Approved

BTEX1063.XLS

^{* =} Out of limit.

^{** =} Greater than 10% of calibration range.



Dm 4/28/95

Method 602 Data Report

Client Sample Number	: MD75-MW4	Client Project No.	: 722450.21020/Mac Dill
Lab Sample Number	: X05175	Lab Project No.	: 95-1063
Date Sampled	: 3/31/95	Dilution Factor	: 20.00
Date Received	: 4/1/95	Method	: 602
Date Prepared	: 4/17/95	Matrix	: Water
Date Analyzed	: 4/17/95	Lab File No.	: BX1041717
·		Method Blank No.	: MB041795

		Sample		
Compound Name	Cas Number	Concentration	RL	
		ug/L	ug/L	
Benzene	71-43-2	94.0*	8.0	
Toluene	108-88-3	**	8.0	
Chlorobenzene	108-90-7	**	8.0	
Ethyl Benzene	100-41-4	580.0*	8.0	
Total Xylenes	108-38-3, 106-42-3	••	8.0	
(m, p & o)	and 95-47-6			
●3,5-Trimethylbenzene	108-67-8	••	8.0	
1,2,4-Trimethylbenzene	95-63-6	••	8.0	
1,2,3-Trìmethylbenzene	526-73-8	**	8.0	
1,2,3,4-Tetramethylbenzene	488-23-3	92.0*	8.0	
Surrogate Recovery (α,α,α-Trifluo	protoluene):	85%	70%-130% (QC limits)	

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

B = Compound also found in the blank.

RL = Reporting Limit.

NA = Not Available/Not Applicable.

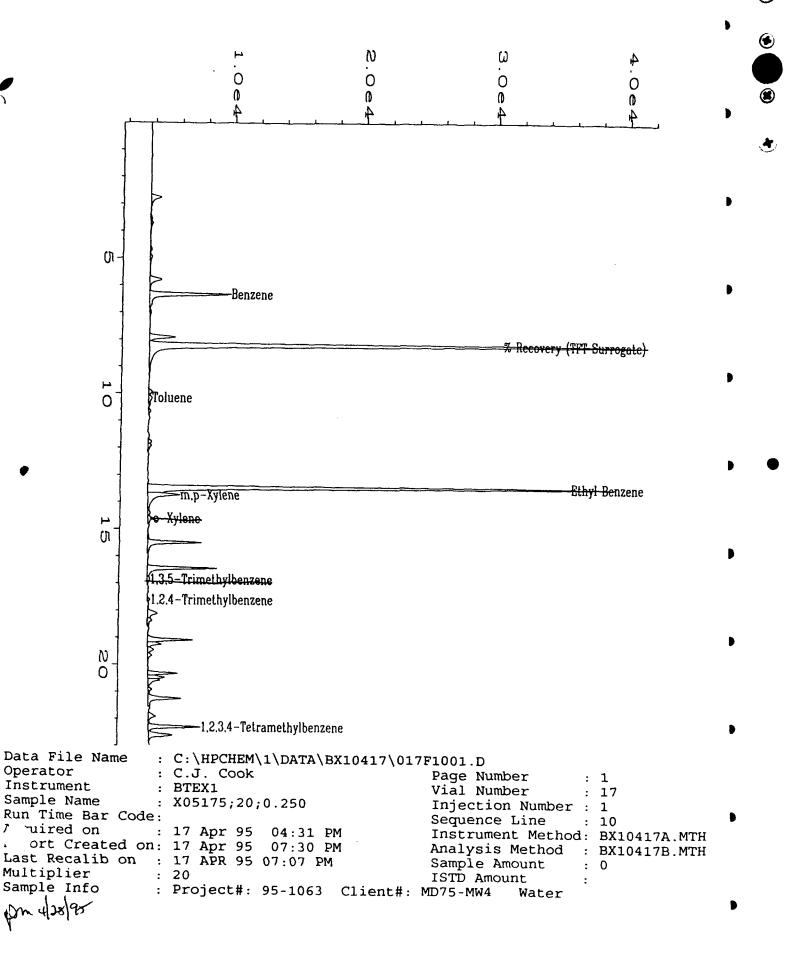
Approved

BTEX1063.XLS

^{* =} Holding Time Surpassed.

^{** =} See BX1041327.

Holding mit used



Method 602 Data Report

Client Sample Number	: MD75-MW6	Client Project No.	: 722450.21020/Mac D
Lab Sample Number	: X05177	Lab Project No.	: 95-1063
Date Sampled	: 3/31/95	Dilution Factor	: 1.00
Date Received	: 4/1/95	Method	: 602
Date Prepared	: 4/14/95	Matrix	: .Water
Date Analyzed	: 4/14/95	Lab File No.	: BX1041345
		Method Blank No.	: MB041495

		Sample		
Compound Name	Cas Number	Concentration	RL	
		ug/L	ug/L	
Benzene	71-43-2	U	0.4	
Toluene	108-88-3	υ	0.4	
Chlorobenzene	108-90-7	υ	0.4	
Ethyl Benzene	100-41-4	0.8	0.4	
Total Xylenes	108-38-3, 106-42-3	U	0.4	
(m, p & o)	and 95-47-6			
1,3,5-Trimethylbenzene	108-67-8	0.5	0.4	
1,2,4-Trimethylbenzene	95-63-6	U	0.4	
1,2,3-Trimethylbenzene	526-73-8	U	0.4	
1,2,3,4-Tetramethylbenzene	488-23-3	3.2	0.4	
Surrogate Recovery (α,α,α-Trifluo	rotoluene):	95%	70%-130% (0	QC limits

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

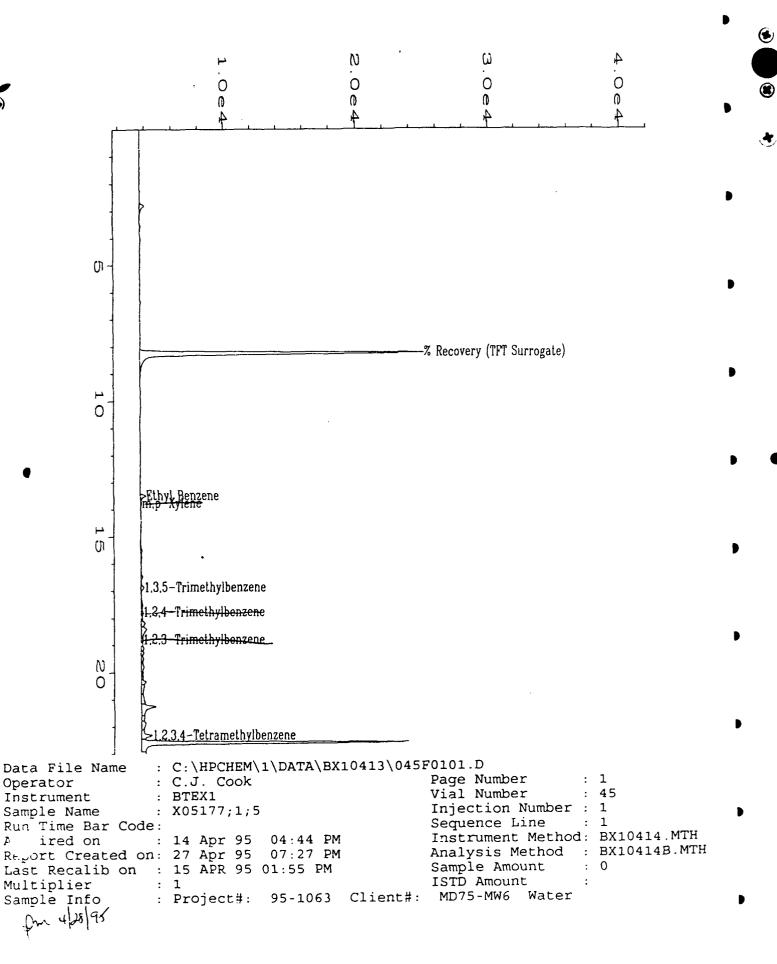
U = Compound analyzed for, but not detected.

B = Compound also found in the blank.

RL = Reporting Limit.

NA = Not Available/Not Applicable.

Approved



Method 602 Data Report

Client Sample Number	: MD75-MW6A	Client Project No.	: 722450.21020/Mac [
Lab Sample Number	: X05180	Lab Project No.	: 95-1063
Date Sampled	: 3/31/95	Dilution Factor	: 1.00
Date Received	: 4/1/95	Method	: 602
Date Prepared	: 4/14/95	Matrix	: Water
Date Analyzed	: 4/14/95	Lab File No.	: BX1041347
		Method Blank No.	: MB041495

		Sample		
Compound Name	Cas Number	Concentration	n RL	
		ug/L	ug/L	
Benzene	71-43-2	3.2	0.4	
Toluene	108-88-3	ι	0.4	
Chlorobenzene	108-90-7	1.2	0.4	
Ethyl Benzene	100-41-4	U	0.4	
Total Xylenes	108-38-3, 106-42-3	U	0.4	
(m, p & o)	and 95-47-6			
1,3,5-Trimethylbenzene	108-67-8	0.5	0.4	
1,2,4-Trimethylbenzene	95-63-6	Ų	0.4	
1,2,3-Trimethylbenzene	526-73-8	U	0.4	
1,2,3,4-Tetramethylbenzene	488-23-3	1.2	0.4	
Surrogate Recovery (α,α,α-Trifluo	rotoluene):	90%	70%	-130% (QC limits

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

B = Compound also found in the blank.

RL = Reporting Limit.

NA = Not Available/Not Applicable.

Approved

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            0
                  Chlorobenzene
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                  >1,3,5-Trimethylbenzene
                  7.2.3 Trimethylbenzene
            N
            0
                  $1,2,3,4-Tetramethylbenzene
Data File Name
                   : C:\HPCHEM\1\DATA\BX10413\047F0101.D
                    : C.J. Cook
                                                        Page Number
                                                        Vial Number
Instrument
                    : BTEX1
                                                                            : 47
Sample Name
                    : X05180;1;5
                                                        Injection Number: 1
Run Time Bar Code:
                                                                            : 1
                                                        Sequence Line
                                                        Instrument Method: BX10414.MTH
                   : 14 Apr 95
                                  06:03 PM
  juired on
...port Created on: 27 Apr 95
                                                        Analysis Method : BX10414B.MTH
                                  08:27 PM
Last Recalib on : 15 APR 95 01:55 PM
                                                        Sample Amount
                                                                            : 0
Multiplier
                                                        ISTD Amount
                                   95-1063 Client#: MD24-MW6A Water
Sample Info
                   : Project#:
  Dm 4/28/95
```

Operator

Method 602 Data Report

Client Comple Nough			
Client Sample Number	: MD75-MW8	Client Project No.	: 722450.21020/Mac I
Lab Sample Number	: X0 ¹72	Lab Project No.	: 95-1063
Date Sampled	: 3/31/95	Dilution Factor	: 1.00
Date Received	: 4/1/95	Method	: 662
Date Prepared	: 4/14/95	Matrix	: Water
Date Analyzed	: 4/14/95	Lab File No.	: BX1041324
		Method Blank No.	: MB041395

		Sample		
Compound Name	Cas Number	Concentration	RL	
		ug/L	ug/L	
Benzene	71-43-2	>60 **	0.4	
Toluene	108-88-3	17	0.4	
Chlorobenz ene	108-90-7	1.3	0.4	
Ethyl Benzene	100-41-4	>60 **	0.4	
Total Xylenes	108-38-3, 106-42-3	110	0.4	
(m, p & o)	and 95-47-6		0.4	
1,3,5-Trimethylbenzene	108-67-8	33	0.4	
1,2,4-Trimethylbenzene	95-63-6	45	0.4	
1,2,3-Trimethylbenzene	526-73-8	40	0.4	
1,2,3,4-Tetramethylbenzene	488-23-3	61 E	0.4	
Surrogate Recovery (α,α,α-Trifluo	rotoluene):	75%	70%-130% (QC limits	

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

** = Greater than 10% of calibration range. See BX1041359 (DF = 10) run past holding times.

QUALIFIERS:

E = Extrapolated value. Exceeds calibration range.

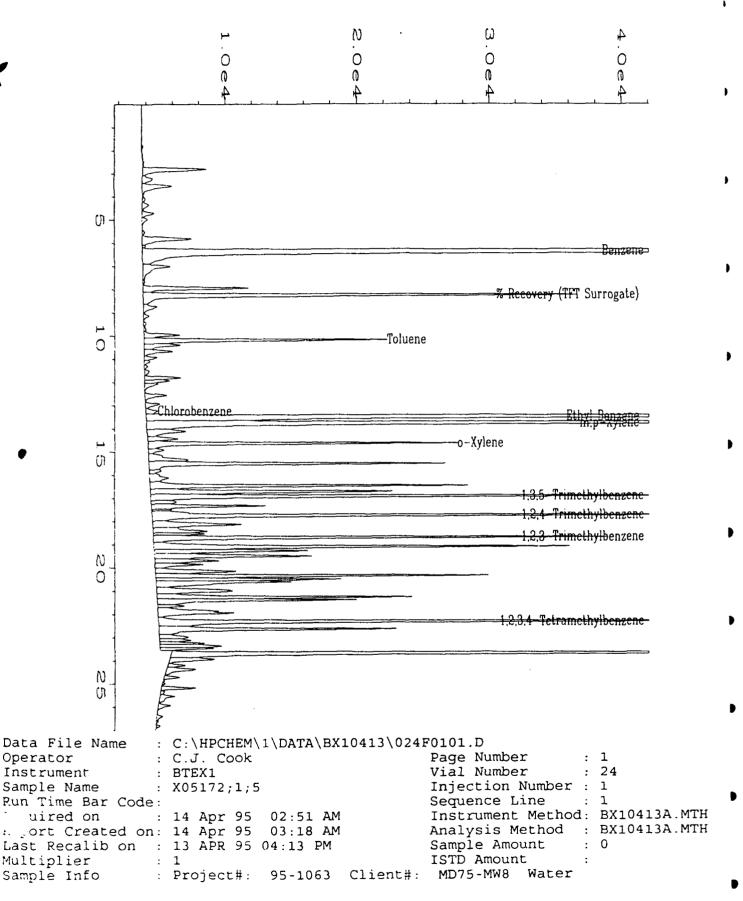
U = Compound analyzed for, but not detected.

B = Compound also found in the blank.

RL = Reporting Limit.

NA = Not Available/Not Applicable.

Approved



Method 602 Data Report

Client Sample Number	: MD75-MW8	Client Project No.	: 722450.21020/Mac Dill
Lab Sample Number	: X05172	Lab Project No.	: 95-1063
Date Sampled	: 3/31/95	Dilution Factor	: 10.00
Date Received	: 4/1/95	Method	: 602
Date Prepared	: 4/14/95	Matrix	: Water
Date Analyzed	: 4/15/95	Lab File No.	: BX1041359
		Method Blank No.	: MB041495

Compound Name	Cas Number	Sample Concentration ug/L		RL ug/L	
Benzene	71-43-2	140.0*	В	4.0	
Toluene	108-88-3	**		4.0	
Chlorobenzene	108-90-7	**		4.0	
Ethyl Benzene	100-41-4	110.0*	В	4.0	
Total Xylenes (m, p & o)	108-38-3, 106-42-3 and 95-47-6	100.0*	В	4.0	
1,3,5-Trimethylbenzene	108-67-8	**		4.0	
1,2,4-Trimethylbenzene	95-63-6	**		4.0	
1,2,3-Trimethylbenzene	526-73-8	••		4.0	
1,2,3,4-Tetramethylbenzene	488-23-3	**		4.0	
Surrogate Recovery (α,α,α-Trifluc	protoluene):	80%		70%-130% (QC limits)	

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

B = Compound also found in the blank.

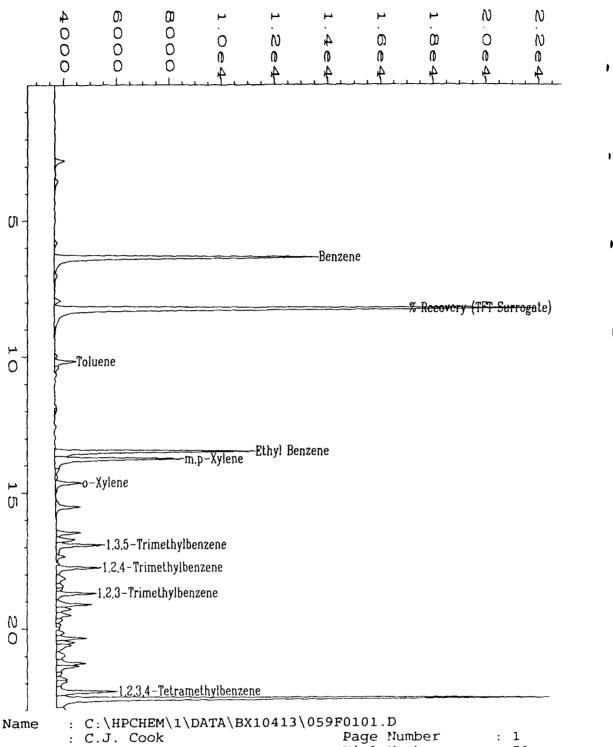
RL = Reporting Limit.

NA = Not Available/Not Applicable.

Approved

^{* =} Holding Time Surpassed.

^{** =} See BX2041516.



Data File Name Operator Vial Number : 59 Instrument : BTEX1 : X05172;10;500ul Injection Number: 1 Sample Name Sequence Line : 1 Run Time Bar Code: Instrument Method: BX10414 Acquired on : 15 Apr 95 01:57 AM Analysis Method : BX10414B.M Report Created on: 27 Apr 95 07:38 PM Sample Amount : 15 APR 95 01:55 PM Last Recalib on ISTD Amount : 0.5 Multiplier : Project#: 95-1063 Client#: MD75-MW8 Water Sample Info

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Method 602 Data Report

: MD75-MW12 Client Project No. : 722450.21020/Mac Dill Client Sample Number Lab Project No. Lab Sample Number : X05169 : 95-1063 **Dilution Factor** : 1.00 **Date Sampled** : 3/31/95 : 602 : 4/1/95 Method **Date Received Date Prepared** : 4/13/95 Matrix : Water : BX1041321 : 4/14/95 Lab File No. **Date Analyzed** Method Blank No. : MB041395

Compound Name	Cas Number	Sample Concentration	RL
		ug/L	ug/L
Benzene	71-43-2	45	0.4
Toluene	108-88-3	1.5	0.4
Chlorobenzene	108-90-7	0.5	0.4
Ethyl Benzene	100-41-4	>60 **	0.4
Total Xylenes	108-38-3, 106-42-3	7.5	0.4
(m, p & o)	and 95-47-6		
,3,5-Trimethylbenzene	108-67-8	6.2	0.4
1,2,4-Trimethylbenzene	95-63-6	20	0.4
1,2,3-Trimethylbenzene	526-73-8	3.2	0.4
1,2,3,4-Tetramethylbenzene	488-23-3	41	0.4
Surrogate Recovery (α,α,α-Trifluo	rotoluene):	75%	70%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

** = Greater than 10% of calibration range. See BX1041357 (DF = 5) run past holding time.

QUALIFIERS:

E = Extrapolated value.

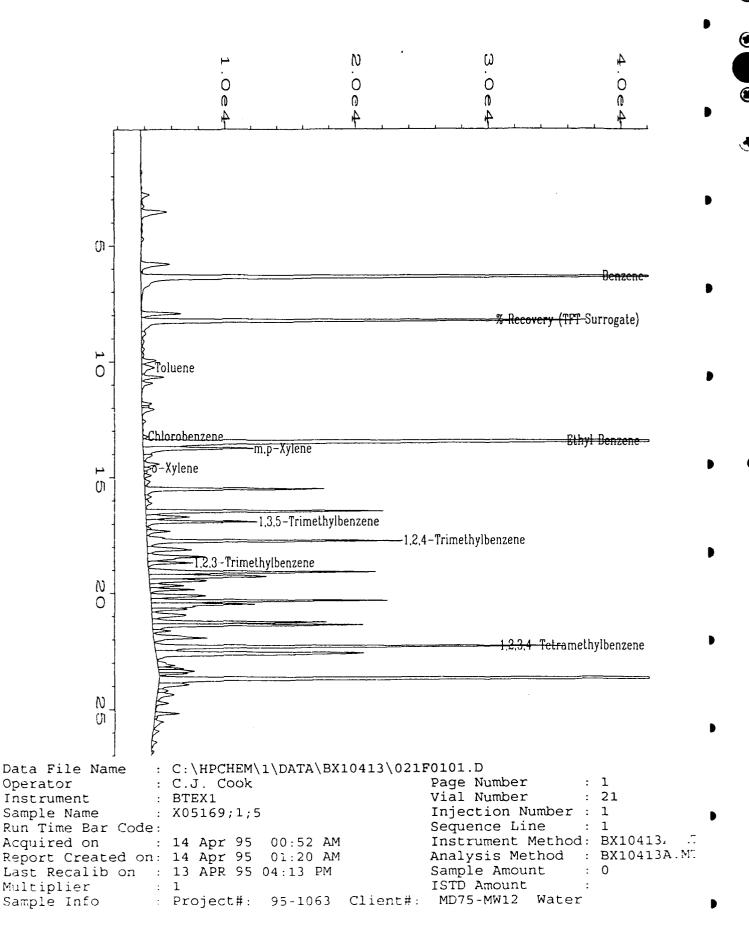
U = Compound analyzed for, but not detected.

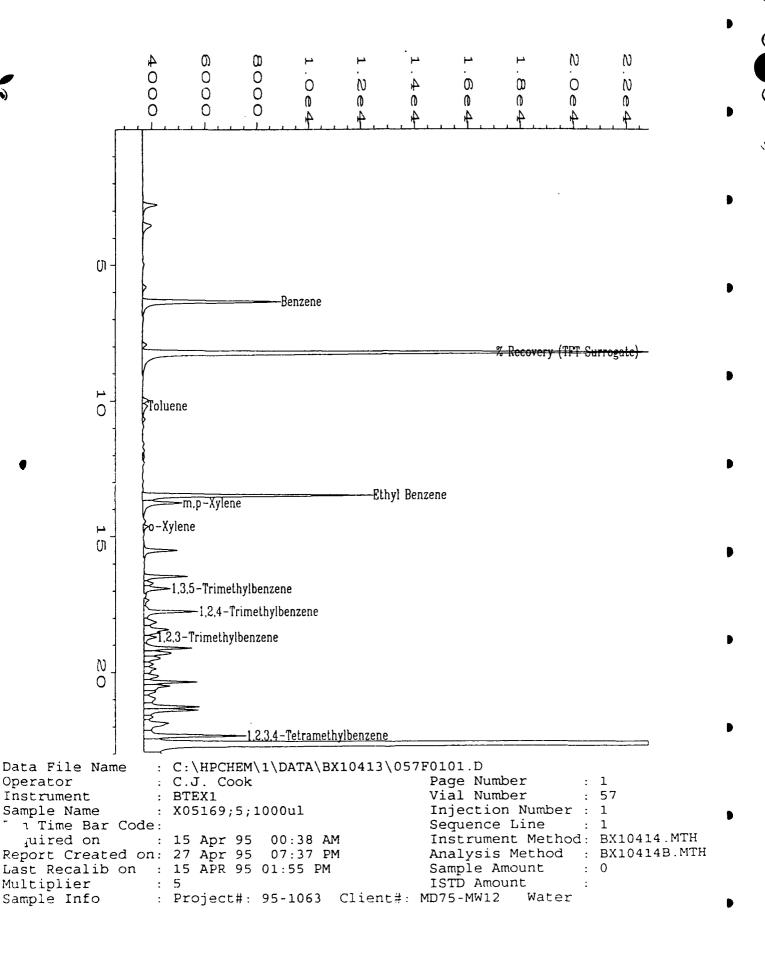
B = Compound also found in the blank.

RL = Reporting Limit.

NA = Not Available/Not Applicable.

A





Method 602/8020 Data Report

Client Sample Number	: MD75-MW12	Client Project No.	: 722450.21020/MacDill
Lab Sample Number	: X05169	Lab Project No.	: 95-1063
Date Sampled	: 3/31/95	Dilution Factor	: 5.00
Date Received	: 4/1/95	Method	: 602
Date Prepared	: 4/14/95	Matrix	: Water
Date Analyzed	: 4/14/95	Lab File No.	: BX1041357
		Method Blank No.	: MB041495

		San	nple	
Compound Name	Cas Number	Concentration		RL
		ug/L		ug/L
Benzene	71-43-2	**		••
Toluene	108-88-3	**		**
Chlorobenzene	108-90-7	**		**
Ethyl Benzene	100-41-4	67 *	В	2.0
Total Xylenes	108-38-3, 106-42-3	**		**
(m, p & o)	and 95-47-6			
1,3,5-Trimethylbenzene	108-67-8	**		**
1,2,4-Trimethylbenzene	95-63-6	**		**
1,2,3-Trimethylbenzene	526-73-8	**		**
1,2,3,4-Tetramethylbenzene	488-23-3	**	_	**
Surrogate Recovery (\alpha, \alpha, \alpha-Trifluo	rotoluene):	90%		70%-130% (QC limits)

QUALIFIERS/NOTES:

E = Extrapolated value. Value exceeds calibration range.

U = Compound analyzed for, but not detected.

B = Compound also found in the blank.

J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

RL = Reporting Limit.

NA = Not Available/Not Applicable.

Total xylenes consist of three isomers, two of which co-elute. The xylene RL is for a single peak.

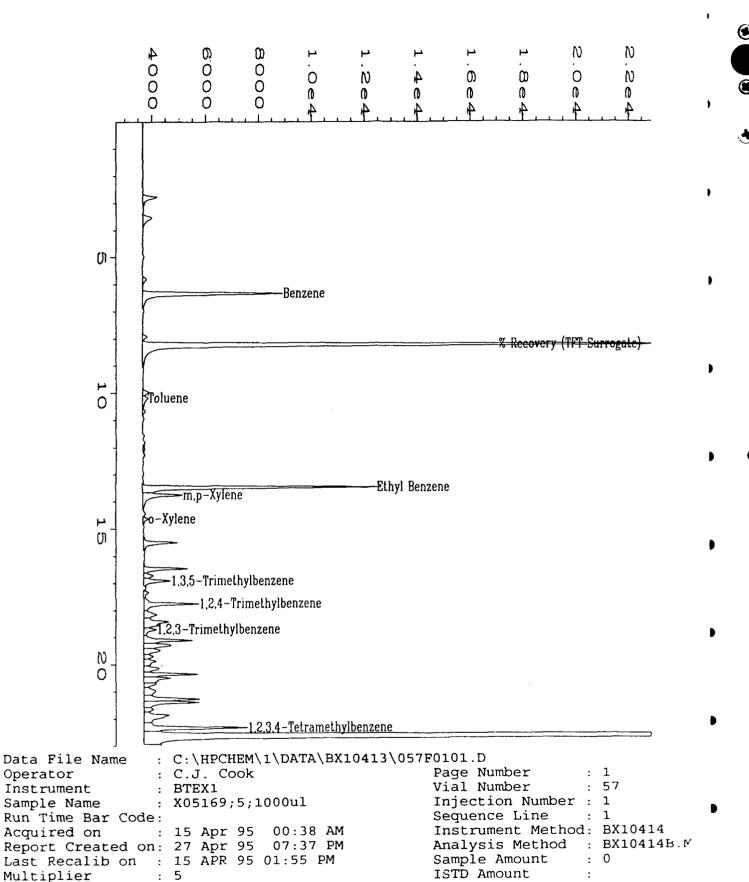
- * = Holding Time surpassed.
- ** = See BX1041321.

Approved

602TMB.XLS; 9/21/95

		External Standard	-	
			\=====================================	===
		HEM\1\DATA\BX10413\		
	: C.J. Co	ook	Page Number : 1	
Instrument		5 4000 3	Vial Number : 57	
sampre Name Run Time Bar	: X05169;	;5;1000ul	Injection Number : 1	
		05 00 20 34	Sequence Line : 1	
Acquired on	•	95 00:38 AM		
		95 07:36 PM	Analysis Method : BX10414B.	MTH
ultiplier		95 01:55 PM	Sample Amount : 0	
=		:#: 95-1063 Client;	ISTD Amount :	
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Sig. 1 in C:	HPCHEM\1\DATA	\BX10413\057F0101.I		
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8.225			37 % Recovery (TFT Surrogate) $9C$	7
10.173	2639 VV	0.181 1 3.0	46 Toluene	10
13.189 * no	ot found *	1 0.086 1 66.9	Chlorobenzene	
13.475	49840 VV	0.086 1 66.9	32 Ethyl Benzene	
13.754	12205 VV	0.118 1 13.2	49 m,p-Xylene	
14.626		0.124 1 2.0	79 o-Xylene	
16.912	6979 VV	0.104 1 7.0	12 1,3,5-Trimethylbenzene	
			99 1,2,4-Trimethylbenzene	
18.703	3809 VV	0.115 1 5.6	95 1,2,3-Trimethylbenzene	
22.326	24892 HH	0.096 1 42.6	34 1,2,3,4-Tetramethylbenzene	
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Sample Info : Project#: 95-1063 Client#: MD75-MW12 Water

Method 602 Data Report

Client Project No. : 722450.21020/Mac Dill Client Sample Number : MD75-MW14 Lab Project No. : 95-1063 Lab Sample Number : X05173 Date Sampled : 3/31/95 Dilution Factor : 1.00 **Date Received** : 4/1/95 Method : 602 Matrix : Water **Date Prepared** : 4/13/95 Lab File No. : BX1041325 **Date Analyzed** : 4/14/95 : MB041395 Method Blank No.

	Sample				
Compound Name	Cas Number	Concentration	RL		
		ug/L	ug/L		
Benzene	71-43-2	>60 **	0.4		
Toluene	108-88-3	1.2	0.4		
Chlorobenzene	108-90-7	1.5	0.4		
Ethyl Benzene	100-41-4	>60 **	0.4		
Total Xylenes	108-38-3, 106-42-3	14	0.4		
(m, p & o)	and 95-47-6				
1,3,5-Trimethylbenzene	108-67-8	1.0	0.4		
1,2,4-Trimethylbenzene	95-63-6	1.7	0.4		
1,2,3-Trimethylbenzene	526-73-8	1.7	0.4		
1,2,3,4-Tetrameth ⁻ /lbenzene	488-23-3	53	0.4		
Surrogate Recovery (α,α,α-Trifluo	rotoluene):	66%*	70%-130% (QC limits)		

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

B = Compound also found in the blank.

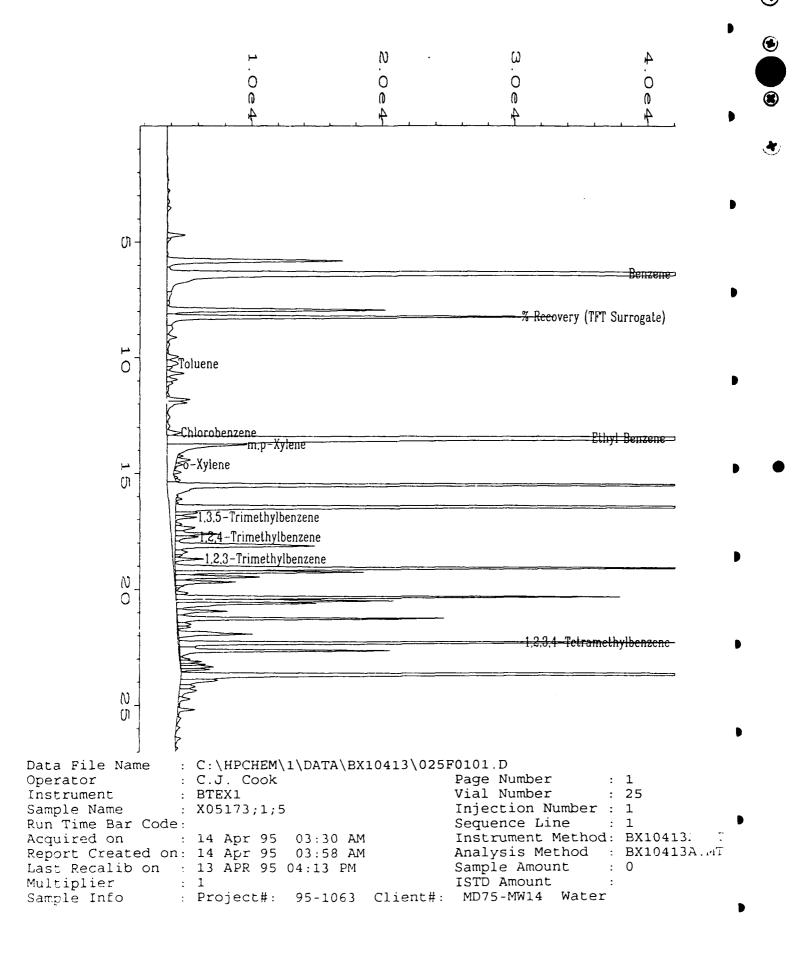
RL = Reporting Limit.

NA = Not Available/Not Applicable.

Approve

^{* =} Out of limit.

^{** =} Greater than 10% of calibration range. See BX1041715 (DF = 20) run past holding time.



Method 602 Data Report

: MD75-MW14 Client Project No. : 722450.21020/Mac Dill Client Sample Number Lab Sample Number : X05173 Lab Project No. : 95-1063 : 3/31/95 Dilution Factor : 20.00 **Date Sampled Date Received** : 4/1/95 Method : 602 : 4/17/95 Matrix : Water **Date Prepared** Date Analyzed : 4/17/95 Lab File No. : BX1041715 Method Blank No. : MB041795

Compound Name	Cas Number	Sample Concentration ug/L	RL ug/L	
Benzene	71-43-2	170.0*	8.0	
Toluene	108-88-3	**	8.0	
Chlorobenzene	108-90-7	**	8.0	
Ethyl Benzene	100-41-4	330.0*	8.0	
Total Xylenes	108-38-3, 106-42-3	32.0* B	8.0	
(m, p & o) 43,5-Trimethylbenzene	and 95-47-6 108-67-8	••	8.0	
1,2,4-Trimethylbenzene	95-63-6	**	8.0	
1,2,3-Trimethylbenzene	526-73-8	**	8.0	
1,2,3,4-Tetramethylbenzene	488-23-3	63.0*	8.0	
Surrogate Recovery (α,α,α-Trifluo	protoluene):	91%	70%-130% (QC limits)	

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

B = Compound also found in the blank.

RL = Reporting Limit.

NA = Not Available/Not Applicable.

Annroyed

^{* =} Holding Time Surpassed.

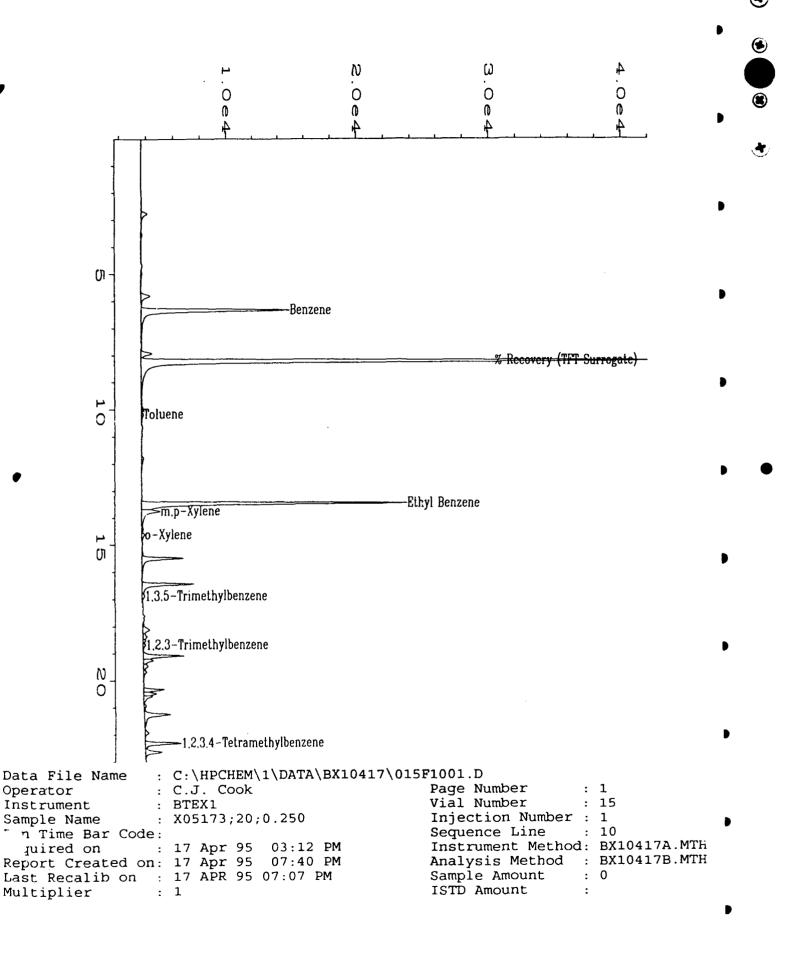
^{** =} See BX1041325.

Not all calibrated peaks were found

Holding Time

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Method 602 Data Report

Client Sample Number Client Project No. : MD75-MW16 : 722450.21020/Mac D Lab Sample Number : X05167 Lab Project No. : 95-1063 **Date Sampled** : 3/31/95 **Dilution Factor** : 1.00 **Date Received** : 4/1/95 Method : 602 : 4/13/95 **Date Prepared** Matrix : Water Lab File No. **Date Analyzed** : 4/13/95 : BX1041314

Method Blank No. : MB041395

		Sample		
Compound Name	Cas Number	Concentration	RL	
		ug/L	ug/L	
Benzene	71-43-2	45	0.4	
Toluene	108-88-3	0.9	0.4	
Chlorobenzene	108-90-7	0.7	0.4	
Ethyl Benzene	100-41-4	**	**	
Total Xylenes	108-38-3, 106-42-3	2.7	0.4	
(m, p & o)	and 95-47-6			
1,3,5-Trimethylbenzene	108-67-8	U 0.4		
1,2,4-Trimethylbenzene	95-63-6	1.4 0.4 0.9 0.4 50 0.4		
1,2,3-Trimethylbenzene	526-73-8			
1,2,3,4-Tetramethylbenzene	488-23-3			
Surrogate Recovery (\alpha,\alpha,\alpha-Trifluo	protoluene):	87%	70%-130% (QC limits)	

Note: Total Xylenes consist of three isomers, two of which co-elute. The Xylene RL is for a single peak.

** = See BX1041355 (DF = 10).

QUALIFIERS:

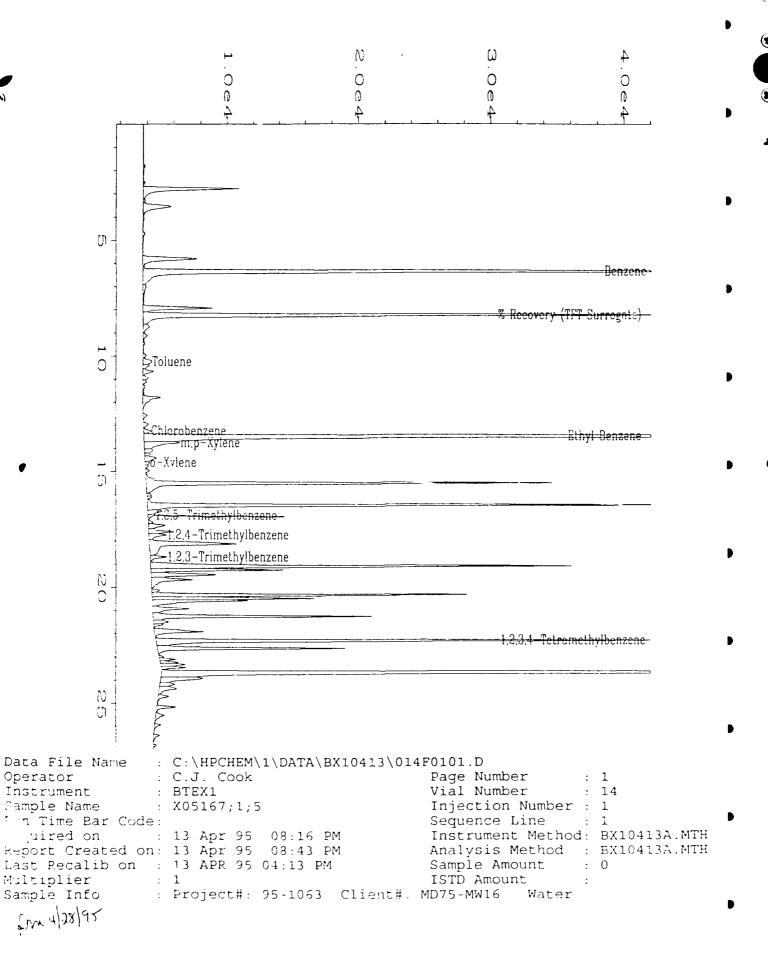
E = Extrapolated value.

U = Compound analyzed for, but not detected.

B = Compound also found in the blank.

RL = Reporting Limit.

NA = Not Available/Not Applicable.



Method 602 Data Report

: MD75-MW16 Client Project No. : 722450.21020/Mac [Client Sample Number Lab Sample Number : X05167 Lab Project No. : 95-1063 : 3/31/95 Dilution Factor : 10.00 **Date Sampled** : 602 Method **Date Received** : 4/1/95 **Date Prepared** : 4/14/95 Matrix : Water Lab File No. : BX1041355 : 4/14/95 Date Analyzed Method Blank No. : MB041495

		Sample	
Compound Name	Cas Number	Concentration	RL
		ug/L	_ug/L
Benzene	71-43-2	+ +	* *
Toluene	108-88-3	**	**
Chlorobenzene	108-90-7	**	**
Ethyl Benzene	100-41-4	79	40
Total Xylenes	108-38-3, 106-42-3	**	**
(m, p & o)	and 95-47-6		
1,3,5-Trimethylbenzene	108-67-8	* *	**
1,2,4-Trimethylbenzene	95-63-6	**	**
1,2,3-Trimethylbenzene	526-73-8	**	**
1,2,3,4-Tetramethylbenzene	488-23-3	**	**
Surrogate Recovery (α,α,α-Trifluo	protoluene):	94%	**

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

** = See BX1041314.

QUALIFIERS:

E = Extrapolated value.

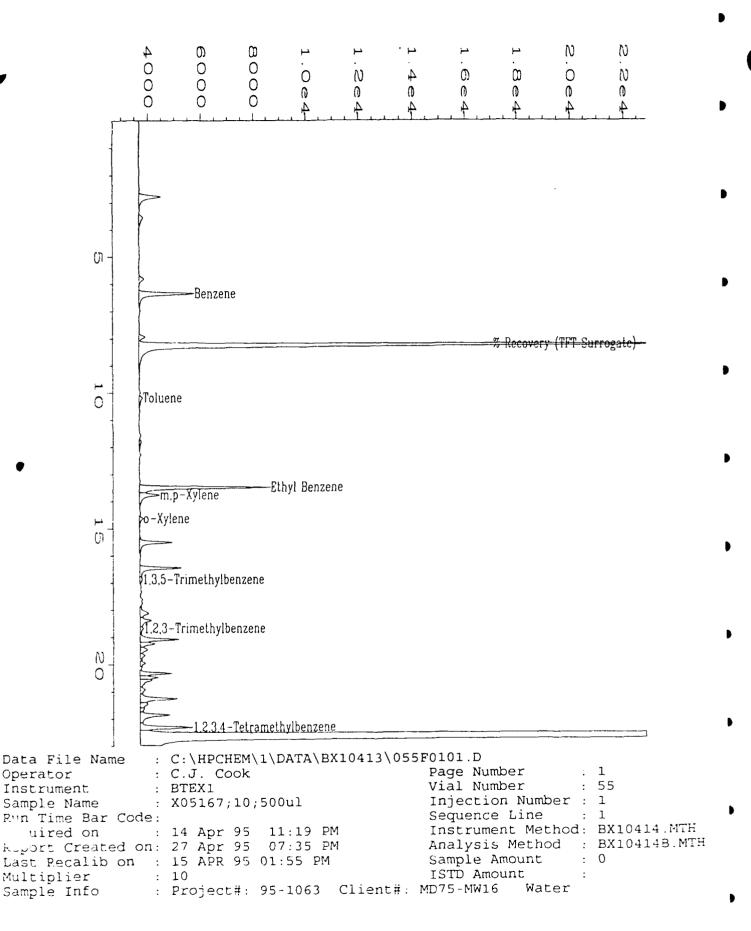
U = Compound analyzed for, but not detected.

B = Compound also found in the blank.

RL = Reporting Limit.

NA = Not Available/Not Applicable.

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Method 602 Data Report

Client Sample Number	: MD75-MW16	Client Project No.	: 722450.21020/Mac D
Lab Sample Number	: X05167DUP	Lab Project No.	: 95-1063
Date Sampled	: 3/31/95	Dilution Factor	: 1.00
Date Received	: 4/1/95	Method	: 602
Date Prepared	: 4/13/95	Matrix	: Water
Date Analyzed	: 4/13/95	Lab File No.	: BX1041315
		Method Blank No.	: MB041395

Compound Name	Cas Number	Sample Concentration ug/L	RL ug/L
Benzene	71-43-2	43	0.4
Toluene	108-88-3	0.8	0.4
Chlorobenzene	108-90-7	0.7	0.4
Ethyl Benzene	100-41-4	>60 **	0.4
Total Xylenes (m, p & o)	108-38-3, 106-42-3 and 95-47-6	2.6	0.4
1,3,5-Trimethylbenzene	108-67-8	U 0.4	
1,2,4-Trimethylbenzene	95-63-6	1.4	0.4
1,2,3-Trimethylbenzene	526-73-8	1.0 0.4	
1,2,3,4-Tetramethylbenzene	488-23-3	50	0.4
Surrogate Recovery (α,α,α-Trifluo	rotoluene):	83%	70%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

B = Compound also found in the blank.

RL = Reporting Limit.

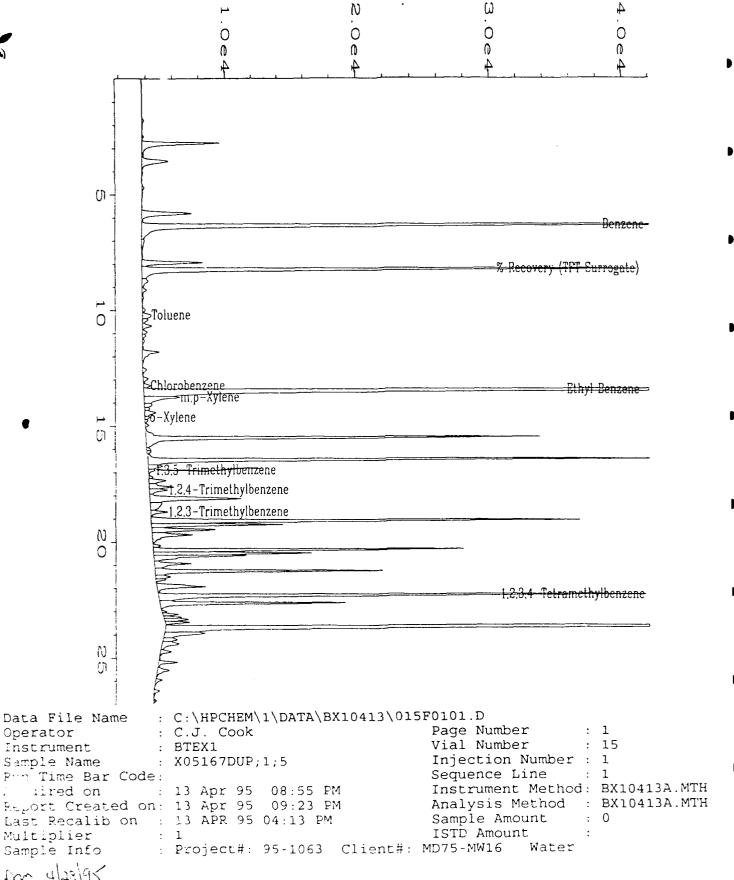
NA = Not Available/Not Applicable.

Analyst

Approved

BTEK1083 KLS

^{** =} Greater than 10% of the calibration range.



tw 933/95

Method 602 Data Report

: 722450.21020/Mac E Client Sample Number : MD75-MW24 Client Project No. Lab Sample Number : X05176 Lab Project No. : 95-1063 **Date Sampled** : 3/31/95 **Dilution Factor** : 1.00 **Date Received** : 4/1/95 Method : 602 **Date Prepared** Matrix : Water : 4/14/95 Date Analyzed : 4/14/95 Lab File No. : BX1041341 Method Blank No. : MB041495

Compound Name	Cas Number	Sample Concentration ug/L	RL ug/L	
Benzene	71-43-2	>80 **	0.4	
Toluene	108-88-3	3.1	0.4	
Chlorobenzene	108-90-7	2.9	0.4	
Ethyl Benzene	100-41-4	>80 **	0.4	
Total Xylenes (m, p & o)	108-38-3, 106-42-3 and 95-47-6	0.7	0.4	
1,3,5-Trimethylbenzene	108-67-8	U	0.4	
1,2,4-Trimethylbenzene	95-63-6	2.1	0.4	
1,2,3-Trimethylbenzene	526-73-8	1.6	0.4	
1,2,3,4-Tetramethylbenzene	488-23-3	83 E	0.4	
Surrogate Recovery (\alpha, \alpha, \alpha-Trifluorotoluene):		102%	70%-130% (QC limits)	

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

B = Compound also found in the blank.

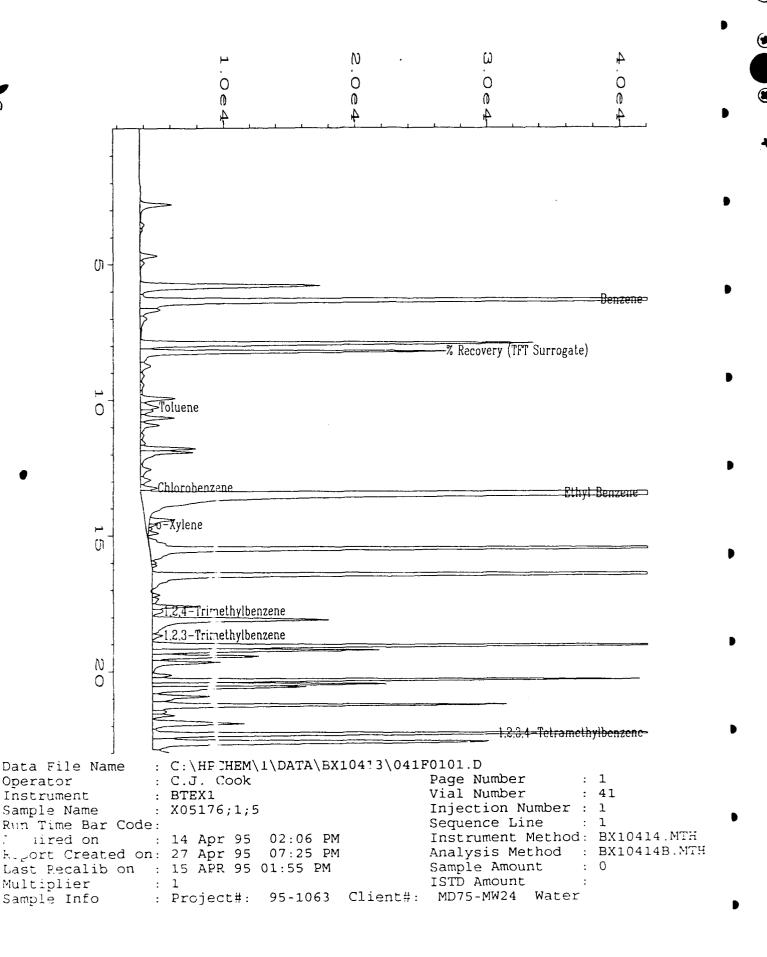
RL = Reporting Limit.

NA = Not Available/Not Applicable.

Analyst

Approved

^{** =} Greater than 10% of calibration range. See BX2041514 (DF=50) run past holding time.





Method 602 Data Report

: 722450.21020/Mac E Client Sample Number : MD75-MW24 Client Project No. Lab Project No. : 95-1063 Lab Sample Number : X05176Dup **Date Sampled** : 3/31/95 **Dilution Factor** : 1.00 Method : 602 **Date Received** : 4/1/95 : 4/14/95 Matrix : Water **Date Prepared** Date Analyzed : 4/14/95 Lab File No. : BX1041342 Method Blank No. : MB041495

		Sample			
Compound Name	Cas Number	Concentration	RL		
		ug/L	ug/L		
Benzene	71-43-2	>80 **	0.4		
Toluene	108-88-3	2.7	0.4		
Chlorobenzene	108-90-7	2.3	0.4	_	
Ethyl Benzene	100-41-4	>80 **	0.4		
Total Xylenes	108-38-3, 106-42-3	0.6	0.4		
(m, p & o)	and 95-47-6				
1,3,5-Trimethylbenzene	108-67-8	U	0.4	D	
1,2,4-Trimethylbenzene	95-63-6	0.9	0.4		
1,2,3-Trimethylbenzene	526-73-8	0.7	0.4		
1,2,3,4-Tetramethylbenzene	488-23-3	62	0.4	ı	
Surrogate Recovery (\alpha, \alpha, \alpha-Trifluo	protoluene):	94%	70%-130% (QC limits		

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

** = Greater than 10% of the calibration range.

QUALIFIERS:

E = Extrapolated value.

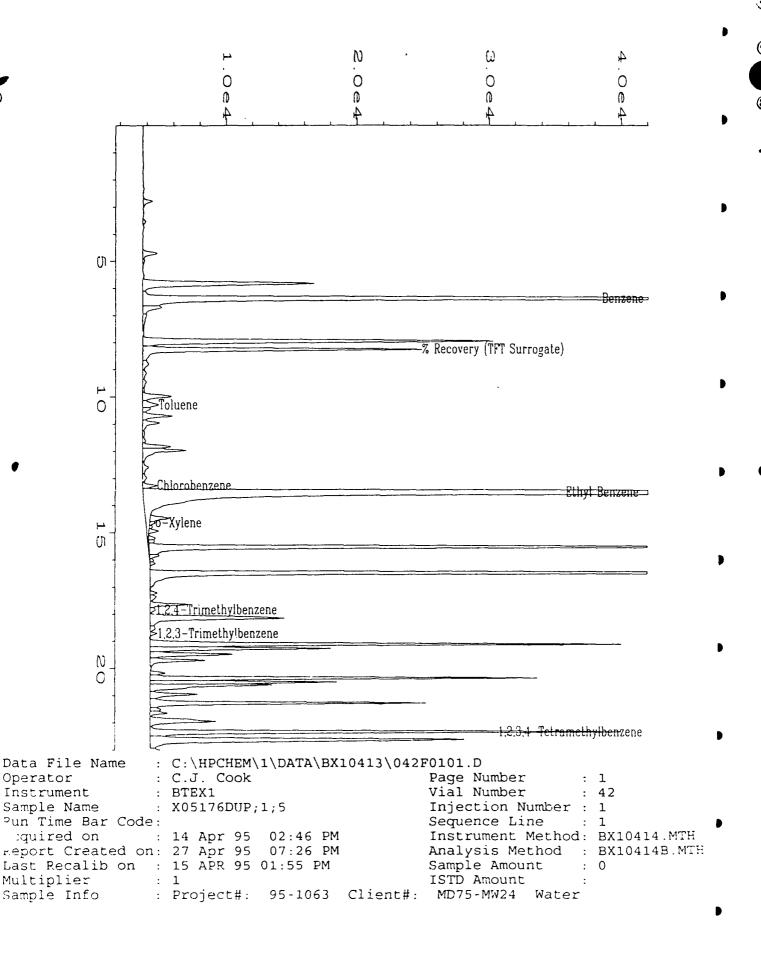
U = Compound analyzed for, but not detected.

B = Compound also found in the blank.

RL = Reporting Limit.

NA = Not Available/Not Applicable.

Approved



Method 602 Data Report

Client Sample Number	: MD75-MW24	Client Project No.	: 722450.21020/Mac Dill
Lab Sample Number	: X05176	Lab Project No.	: 95-1063
Date Sampled	: 3/31/95	Dilution Factor	: 50.00
Date Received	: 4/1/95	Method	: 602
Date Prepared	: 4/15/95	Matrix	: Water
Date Analyzed	: 4/15/95	Lab File No.	: BX2041514
		Method Blank No.	: MB041595

Compound Name	Cas Number	Sample Concentration ug/L	RL ug/L
Benzene	71-43-2	96.0*	20.0
Toluene	108-88-3	**	20.0
Chlorobenzene	108-90-7	**	20.0
Ethyl Benzene	100-41-4	**	20.0
Total Xylenes (m, p & o)	108-38-3, 106-42-3 and 95-47-6	100.0* B	20.0
1,3,5-Trimethylbenzene	108-67-8	* *	20.0
1,2,4-Trimethylbenzene	95-63-6	**	20.0
1,2,3-Trimethylbenzene	526-73-8	**	20.0
1,2,3,4-Tetramethylbenzene	488-23-3	72.0*	20.0
Surrogate Recovery (α,α,α-Trifluo	protoluene):	87%	70%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

B = Compound also found in the blank.

RL = Reporting Limit.

NA = Not Available/Not Applicable.

Approved

^{* =} Holding Time Surpassed.

^{** =} See BX1041341.

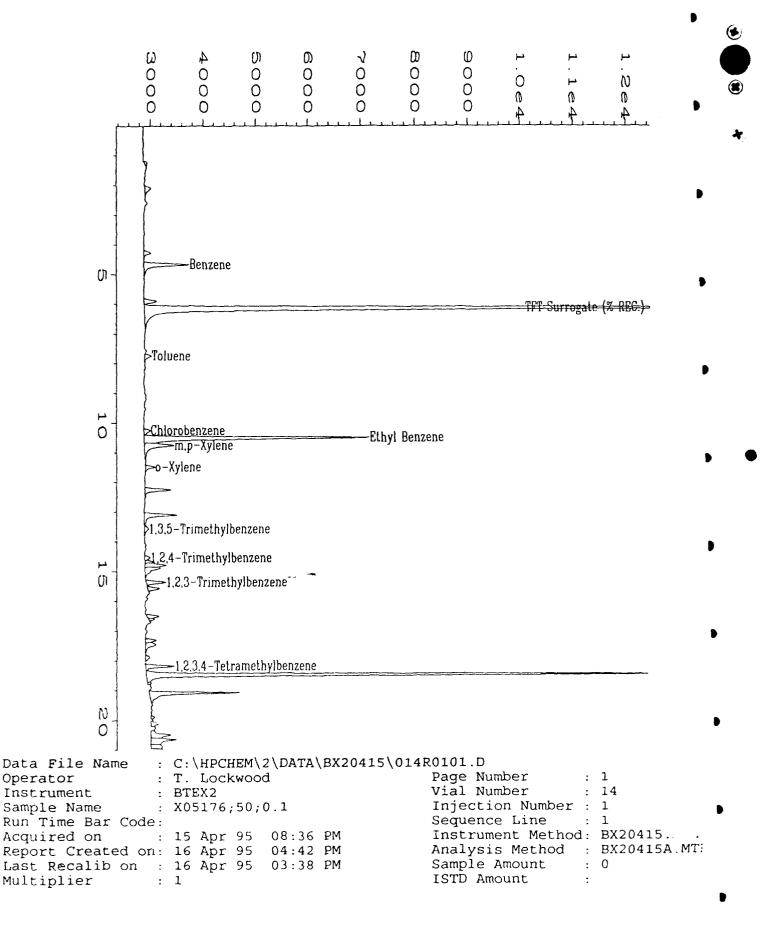
Sig.	2	in	<pre>C:\HPCHEM\2\DATA\BX20415\014R0101.D</pre>	
------	---	----	--	--

Ret Time	Area	Туре	Width	Ref#	ug/L	Name
-			- -			
4.660	5594	BB	0.098	1	1.914	Benzene XSO
6.143	86867	VB	0.096	1-R	87.270	TFT Surrogate (% REC.)
7.728	902	VB	0.104	1	0.350	Toluene
10.247	810	вv	0.102	1	0.373	Chlorobenzene
10.493	24823	VV	0.089	1	10.830	Ethyl Benzene XSC
10.741	4517	VB	0.116	1	1.605	m, p-Xylene)
11.477	958	BB	0.084	1	0.431	0-Xylene Chusc
13.561	724	VB	0.149	1	0.223	1,3,5-Trimethylbenzene
14.531	656	BV	0.113	1	0.296	1,2,4-Trimethylbenzene
5.354	1942	PV	0.085	1	0.969	1,2,3-Trimethylbenzene
¶8.173	2698	PV	0.079	1	1.446	1,2,3,4-Tetramethylbenzene \mathcal{B}

Time Reference Peak Expected RT Actual RT Difference 2 6.120 6.143 0.023

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Evergreen Analytical, Inc. 4036 Youngfield, Wheat Ridge, CO 80033 (303) 425-6021



BTEX Matrix Spike/Matrix Spike Duplicate Data Report

Client Sample No. : MD75-MW16 Client Project No. : 722450.21020

 Lab Sample No.
 : X05167
 Lab Project No.
 : 95-1063

 Date Sampled
 : 3/31/95
 EPA Method No.
 : 602

 Date Received
 : 4/1/95
 Matrix
 : Water

 Date Prepared
 : 4/13/95
 Lab File Number(s)
 : BX1041414,15

 Date Analyzed
 : 4/13/95
 Method Blank
 : MB041395

	Spike	Sample	MS		QC	
Compound	Added	Concentration	Concentration	MS	Limits	
·	(ug/L)	(ug/L)	(ug/L)	%REC	%REC	
Benzene	20.0	44.8	58.9	70.5	50-150	
Toluene	20.0	0.9	16.5	78.0	50-148	
Ethyl Benzene	20.0	108.0 E	118.1 E	50.5	50-150	
m,p-Xylene	40.0	2.7	36.2	83.7	50-150	
o-Xylene	20.0	0.0	15.6	78.0	50-150	
Chlorobenzene	20.0	0.7	16.6	79.5	55-135	
1,3,5-TMB	20.0	0.0	16.3	81.4	50-150	
1,2,4-TMB	20.0	1.4	20.3	94.5	50-150	
1,2,3-TMB	20.0	0.9	18.0	85.7	50-150	
1,2,3,4-TeMB	20.0	49.6	68.0 E	92.0	50-150	

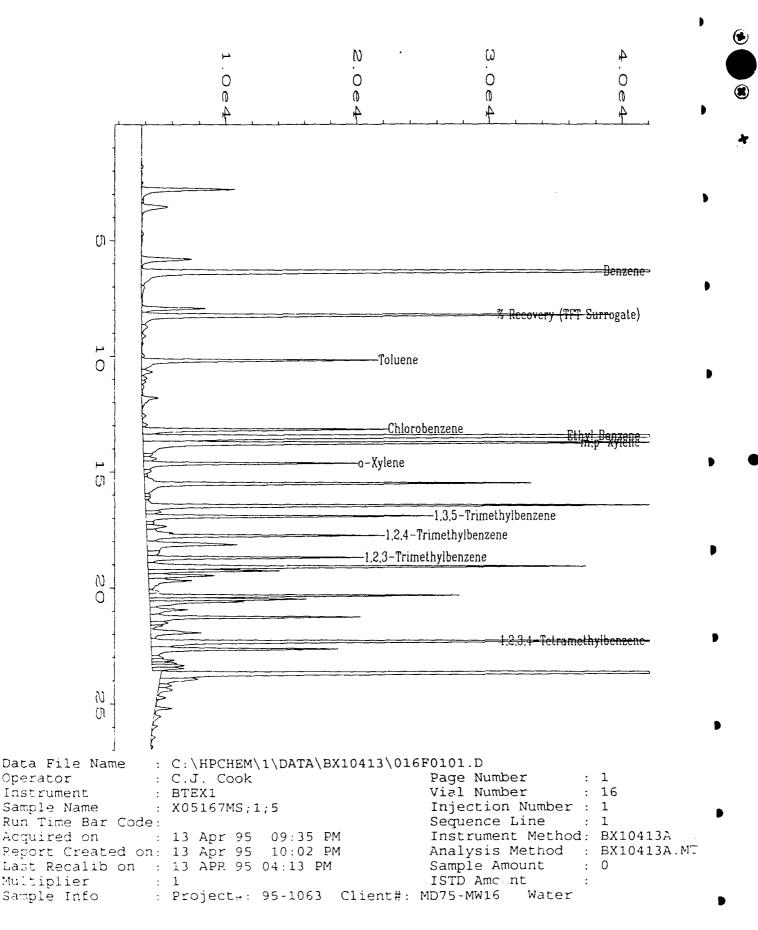
	Spike	MSD			QC	
Compound	Added	Concentration	MSD	RPD	Limits	
	(ug/L)	(ug/L)	%REC		RPD	%REC
Benzene	20.0	57.2	61.8	3.3	25	50-150
Toluene	20.0	16.1	76.2	0.6	25	50-148
Ethyl Benzene	20.0	114.7 E	33.4	10.2	25	50-150
m,p-Xylene	40.0	35.3	81.5	0.7	25	50-150
o-Xylene	20.0	15.3	76.5	0.5	25	50-150
Chlorobenzene	20.0	16.3	78.0	0.5	25	55-135
1,3,5-TMB	20.0	16.1	80.5	0.3	25	50-150
1,2,4-TMB	20.0	20.0	93.0	0.4	25	50-150
1,2,3-TMB	20.0	17.7	84.0	0.5	25	50-150
1,2,3,4-TeMB	20.0	66.9 E	86.5	1.5	25	50-150

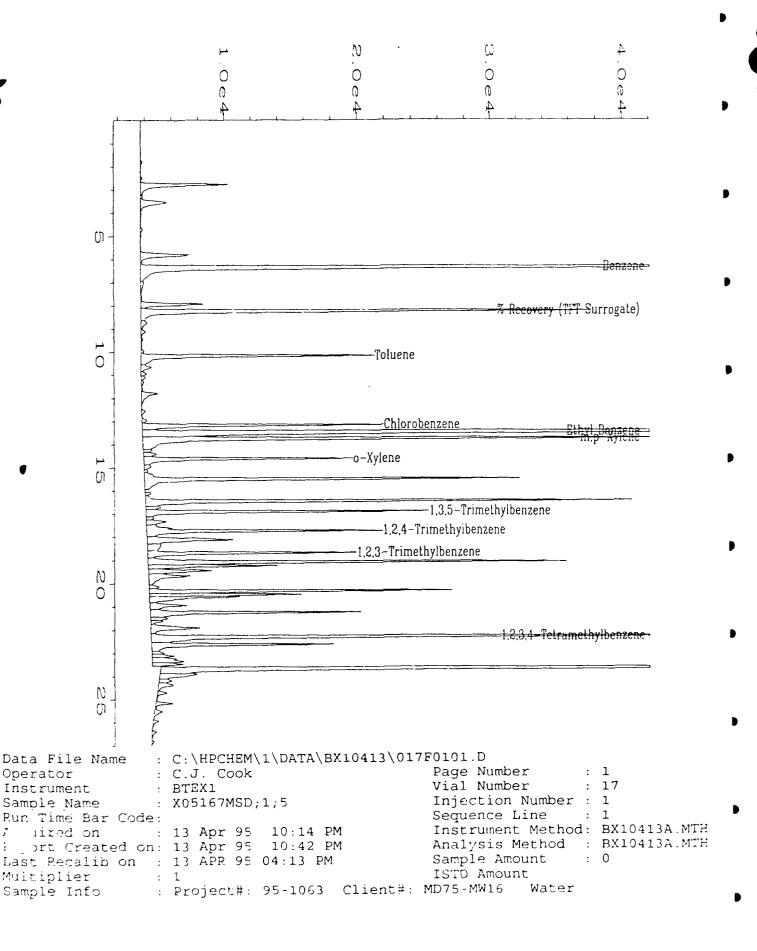
* = Values outsid	e of QC limi	ts.		
RPD:	0	out of (10) outside l	limits.	
Spike Recovery:	1	out of (20) outside l	limits.	
Comments:	F - Evce	ede calibration range		

Analyst

Approved

MS1063A.XLS





Evergreen Analytical, Inc. 4036 Youngfield, Wheat Ridge, CO 80033 (303) 425-6021

BTEX Matrix Spike/Matrix Spike Duplicate Data Report

Client Sample No. : MD75-MW24 Client Project No. : 722450.2102 Lab Sample No. Lab Project No. : 95-1063 : X05176 EPA Method No. **Date Sampled** : 602 : 3/31/95 **Date Received** : 4/1/95 Matrix : Water

 Date Prepared
 : 4/14/95
 Lab File Number(s)
 : BX1041443,44

 Date Analyzed
 : 4/14/95
 Method Blank
 : MB041495

	Spike	Sample	MS			QC
Compound	Added	Concentration	Concentration	1	MS	Limits
	(ug/L)	(ug/L)	(ug/L)		%REC	%REC
Benzene	20.0	127.7 E	138.5	Е	54.0	50-150
Toluene	20.0	3.1	19.6		82.5	50-148
Ethyl Benzene	20.0	* *	**		* *	50-150
m,p-Xylene	40.0	0.0	57.0		142.5	50-150
o-Xylene	20.0	0.7	15.4		73.5	50-150
Chlorobenzene	20.0	2.9	18.8		79.5	55-135
1,3,5-TMB	20.0	0.0	15.0		75.0	50-150
1,2,4-TMB	20.0	2.1	18.3		81.0	50-150
1,2,3-TMB	20.0	1.6	16.7		75.5	50-11
1,2,3,4-TeMB	20.0	83.3 E	99.2	E	79.5	50-150

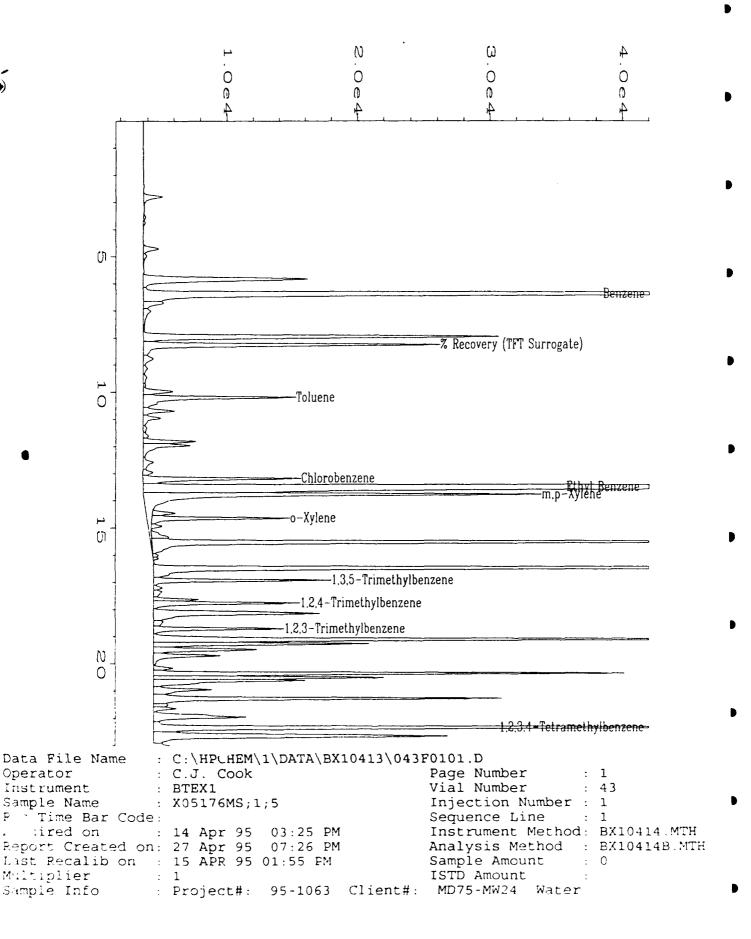
	Spike	MSD	1		C	ıc
Compound	Added	Concentration	MSD	RPD	Lir	nits
	(ug/L)	(ug/L)	%REC		RPD	%REC
Benzene	20.0	NA	NA	NA	25	50-150
Toluene	20.0	NA	NA	NA	25	50-148
Ethyl Benzene	20.0	NA	NA	NA	25	50-150
m,p-Xylene	40.0	NA	NA	NA	25	50-150
o-Xylene	20.0	NA	NA	NA	25	50-150
Chlorobenzene	20.0	NA	NA	NA	25	55-135
1,3,5-TMB	20.0	NA	NA	NA	25	50-150
1,2,4-TMB	20.0	NA	NA	NA	25	50-150
1,2,3-TMB	20.0	NA	NA	NA	25	50-150
1,2,3,4-TeMB	20.0	NA	NA NA	NA	25	50-150

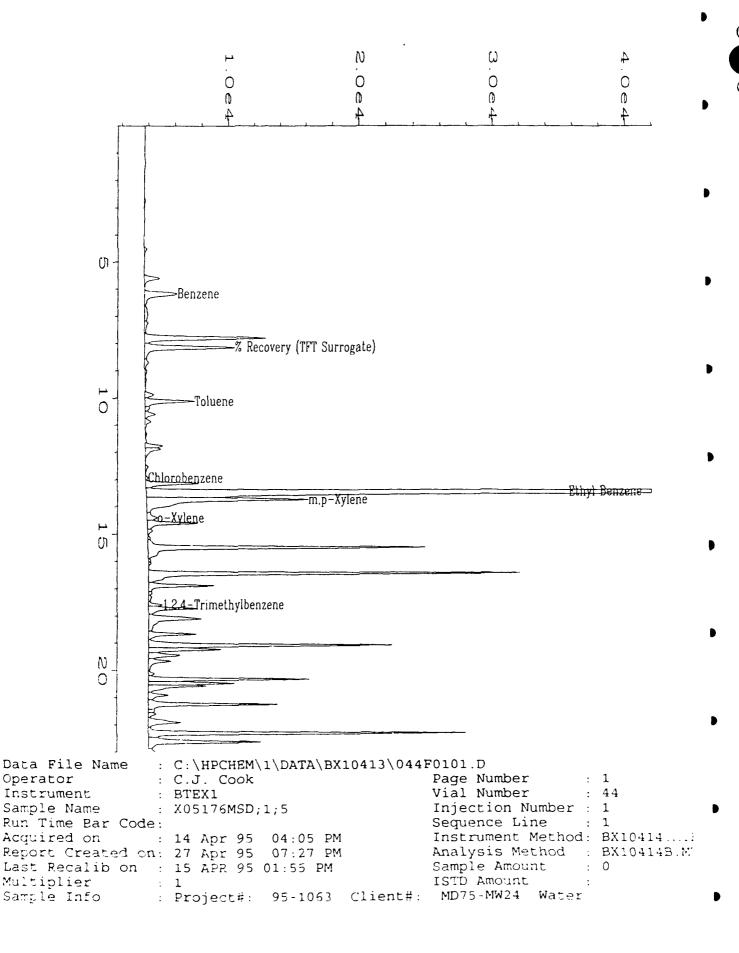
RPD:	0	out of (0) outside limits.			
Spike Recovery:	0	out of (10) outside limits.			
0	MSD did not purge properly. The surrogate recovery was 36%. See MS/MSD				
Comments:	10120 010	not burge property. The surrogate recovery was 30 %. See MS/MSD			
Comments:		W16 and LCS041495. E = Exceeds the calibration range.			

Analyst

Approved

M5751063 XLS





Evergreen Analytical, Inc. 4036 Youngfield, Wheat Ridge, CO 80033 (303) 425-6021

TOTAL VOLATILE HYDROCARBONS TVH Matrix Spike/Matrix Spike Duplicate Data Report

Client Sample No.

: MD75-MW24

Client Project No.

: 722450.21020/MAC

Lab Sample No.

: X05176

Lab Project No. EPA Method No.

: 5030/8015 Mod.

Date Sampled
Date Received

: 3/31/95 : 4/1/95

Matrix

: Water

: 95-1063

Date Prepared
Date Analyzed

: 4/1/95

: 4/14/95

Method Blank

: MB041495

	Spike	Sample	MS		ac
Compound	Added	Concentration	Concentration	MS	Limits
	(mg/L)	(mg/L)	(mg/L)	%REC	%REC
Gasoline	2.00	3.50	4.62	56%	60-140

	Spike	MSD				C
Compound	Added	Concentration	MS	RPD	Lin	nits
	(mg/L)	(mg/L)	%REC		RPD	%REC
Gasoline	2.00	5.80	115%	69*	50	60-140

+ _	Value	outside	of OC	limite
~ ==	values	OUISIGE	OI UIL	mmis.

RPD:

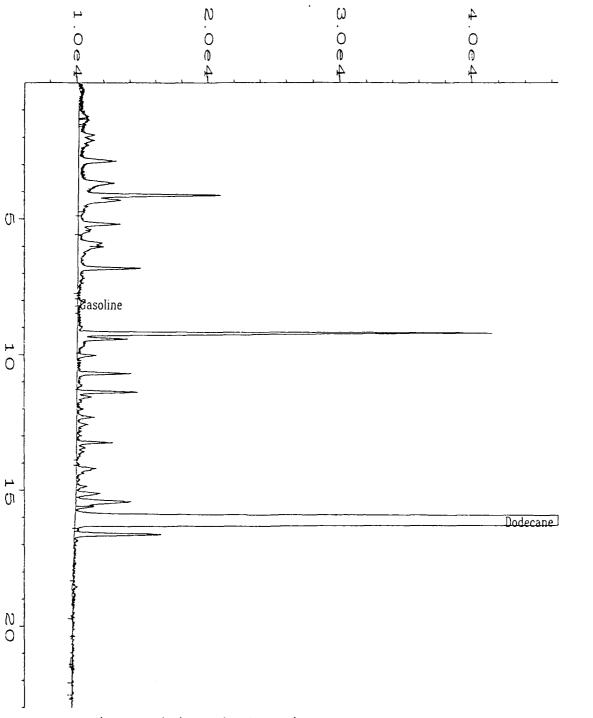
1 out of (1) outside limits.

Spike Recovery:

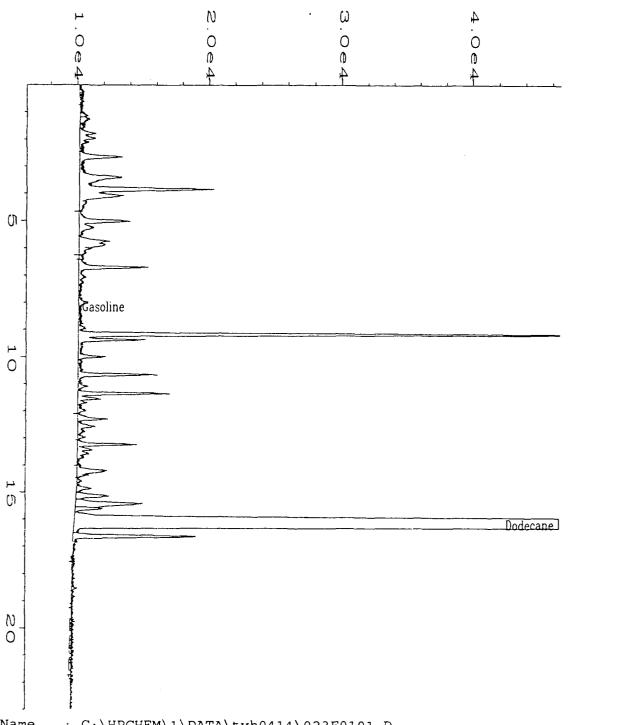
0 out of (2) outside limits.

Comments:

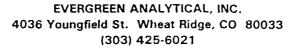
NA = Not analyzed/not applicable.



Data File Name : C:\HPCHEM\1\DATA\tvh0414\022F0101.D Operator : Dawn N. Guildner Page Number : 22 Instrument : TVH Vial Number Sample Name : X05176 MS Injection Number: 1 Run Time Bar Code: : 1 Sequence Line Acquired on : 14 Apr 95 11:59 PM Report Created on: 16 Apr 95 02:39 PM Instrument Method: TVH1BAS. ... Analysis Method : TVH0415.MT Last Recalib on : 16 APR 95 02:01 PM Sample Amount Multiplier ISTD Amount



Data File Name :	C:\HPCHEM\1\DATA\tvh0414\023I	F0101.D	
Operator : 1	Dawn N. Guildner	Page Number :	1
Instrument : '	TVH	Vial Number :	
Sample Name : :	X05176 MSD	Injection Number :	1
Run Time Bar Code:		Sequence Line :	
uired on : :	15 Apr 95 00:35 AM	Instrument Method:	TVH1BASE.MTH
Ruport Created on:	16 Apr 95 02:39 PM	Analysis Method :	TVH0415.MTH
Last Recalib on : :		Sample Amount :	
Multiplier :	1	ISTD Amount :	



Method 602 Data Report

Client Sample Number	: RINSEATE BLANK	Client Project No.	: 722450.21020/Mac E
Lab Sample Number	: X05182	Lab Project No.	: 95-1063
Date Sampled	: 3/31/95	Dilution Factor	: 1.00
Date Received	: 4/1/95	Method	: 602
Date Prepared	: 4/14/95	Matrix	: Water
Date Analyzed	: 4/14/95	Lab File No.	: BX1041350
		Method Blank No.	: MB041495

		Sample			
Compound Name	Cas Number	Concentration	RL		
		ug/L	ug/L		
Benzene	71-43-2	U	0.4		
Toluene	108-88-3	U	0.4		
Chlorobenzene	108-90-7	υ	0.4		
Ethyl Benzene	100-41-4	U	0.4		
Total Xylenes	108-38-3, 106-42-3	U	0.4		
(m, p & o)	and 95-47-6				
1,3,5-Trimethylbenzene	108-67-8	U	0.4		
1,2,4-Trimethylbenzene	95-63-6	υ	0.4		
1,2,3-Trimethylbenzene	526-73-8	U	0.4		
1,2,3,4-Tetramethylbenzene	488-23-3	U	0.4		
Surrogate Recovery (a,a,a-Trifluo	rotoluene):	94%	70%-130% (QC limits)		

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

B = Compound also found in the blank.

RL = Reporting Limit.

NA = Not Available/Not Applicable.

Approved

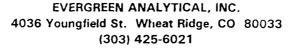
81EY1363 XLS

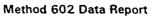
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             U)
                                                                    7 Recovery (TFT Surrogate)
                   Toluene
                   m.p-Xylene
             (I)
                   1,35-Trimethylbenzene
             N
             0
Data File Name
                  : C:\HPCHEM\1\DATA\BX10413\050F0101.D
                                                           Page Number
                     : C.J. Cook
                                                           Vial Number
                                                                                : 50
Instrument
                     : BTEX1
Sample Name
                     : X05182;1;5
                                                           Injection Number : 1
  n Time Bar Code:
                                                           Sequence Line
                                                           Instrument Method: BX10414.MTH
```

quired on : 14 Apr 95 08:02 PM Report Created on: 27 Apr 95 08:03 PM Last Recalib on : 15 APR 95 01:55 PM Analysis Method : BX10414B.MTH Sample Amount : 0 Multiplier ISTD Amount : Project#: 95-1063 Client#: RINSEATE BLANK Sample Info

Dm 4/25/95

Operator





Client Sample Number	: FIELD BLANK	Client Project No.	: 722450.21020/Mac C
Lab Sample Number	: X05181	Lab Project No.	: 95-1063
Date Sampled	: 3/31/95	Dilution Factor	: 1.00
Date Received	: 4/1/95	Method	: 602
Date Prepared	: 4/14/95	Matrix	: Water
Date Analyzed	: 4/14/95	Lab File No.	: BX1041348
		Method Blank No.	: MB041495

	Sample				
Compound Name	Cas Number	Concentration	RL	_	
		ug/L	ug/L	÷	
Benzene	71-43-2	U	0.4		
Toluene	108-88-3	U	0.4		
Chlorobenzene	108-90-7	U	0.4	•	
Ethyl Benzene	100-41-4	υ	0.4		
Total Xylenes	108-38-3, 106-42-3	U	0.4		
(m, p & o)	and 95-47-6			_	
1,3,5-Trimethylbenzene	108-67-8	U	0.4	Þ	
1,2,4-Trimethylbenzene	95-63-6	υ	0.4		
1,2,3-Trimethylbenzene	526-73-8	υ	0.4		
1,2,3,4-Tetramethylbenzene	488-23-3	U	0.4	•	
Surrogate Recovery (a,a,a-Trifluo	protoluene):	92%	70%-130% (QC I	imits)	

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

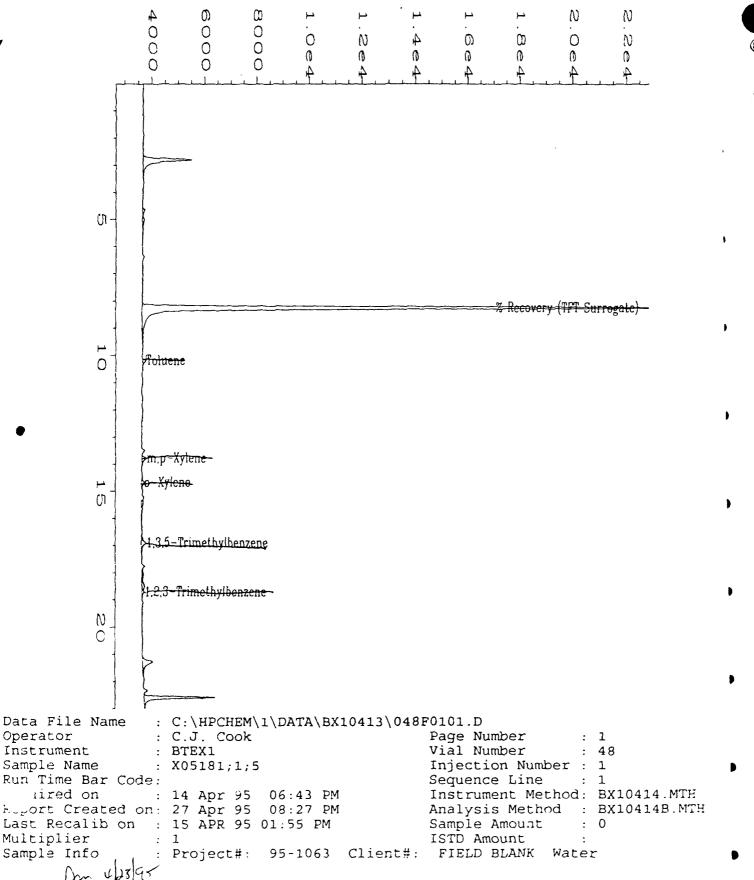
B = Compound also found in the blank.

RL = Reporting Limit.

NA = Not Available/Not Applicable.

Approved

BTEX1063 YUS



pm 4/3/95

Operator

Method 602 Data Report

Client Sample Number	: Trip Blank	Client Project No.	: 722450.21020/Mac D
Lab Sample Number	: X05170	Lab Project No.	: 95-1063
Date Sampled	: 3/31/95	Dilution Factor	: 1.00
Date Received	: 4/1/95	Method	: 602
Date Prepared	: 4/13/95	Matrix	: Water
Date Analyzed	: 4/14/95	Lab File No.	: BX1041322
		Method Blank No.	: MB041395

		Sample		
Compound Name	Cas Number	Concentration	RL	
		ug/L	ug/L	
Benzene	71-43-2	Ü	0.4	
Toluene	108-88-3	U	0.4	
Chlorobenzene	108-90-7	υ	0.4	
Ethyi Benzene	100-41-4	U	0.4	
Total Xylenes	108-38-3, 106-42-3	U	0.4	
(m, p & o)	and 95-47-6			
1,3,5-Trimethylbenzene	108-67-8	U	0.4	
1,2,4-Trimethylbenzene	95-63-6	U	0.4	
1,2,3-Trimethylbenzene	526-73-8	U	0.4	
1,2,3,4-Tetramethylbenzene	488-23-3	υ	0.4	
Surrogate Recovery (α,α,α-Trifluo	protoluene):	77%	70%-130% (QC li	mits)

Note: Total Xylenes consist of three isomers, two of which co-elute. The Xylene RL is for a single peak.

QUALIFIERS:

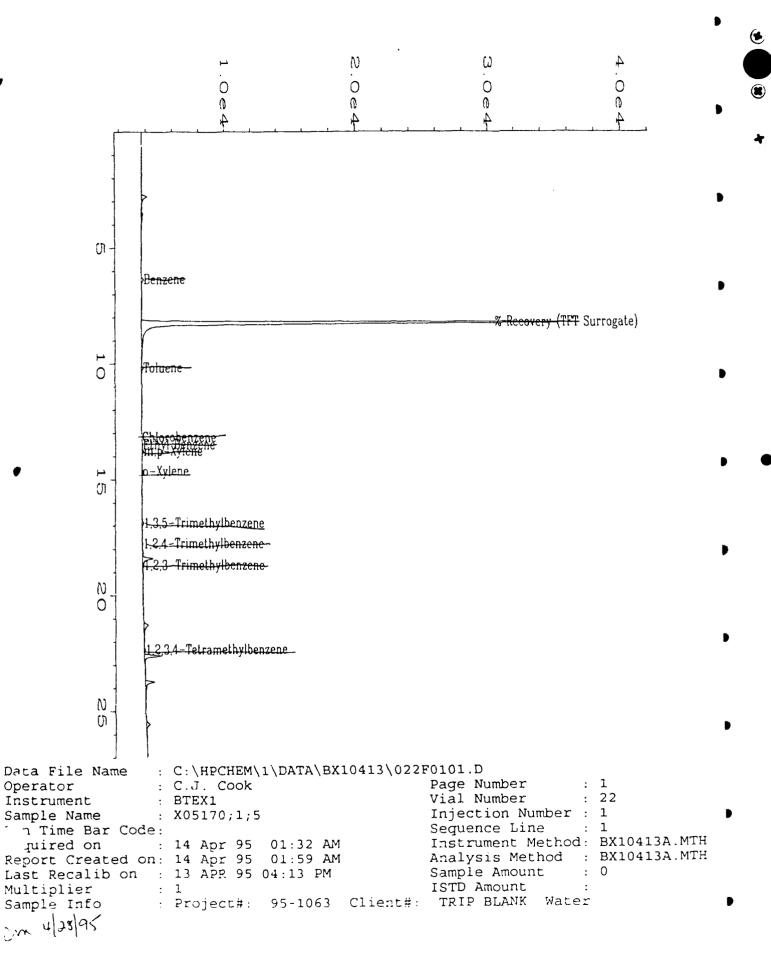
E = Extrapolated value.

U = Compound analyzed for, but not detected.

B = Compound also found in the blank.

RL = Reporting Limit.

NA = Not Available/Not Applicable.



Method 602 Data Report Method Blank Report

Method Blank Number

: MB041395

Client Project No.

: 722450.21020/Mac E

Date Prepared

: 4/13/95

Lab Project No.

: 95-1063

Date Analyzed

Dilution Factor

: 1.00

: 4/13/95

Method

: 602/8020

Matrix

: Water

Lab File No.

: NV-F0101.D

		Sample		
Compound Name	Cas Number	Concentration	RL	
		ug/L	ug/L	
Benzene	71-43-2	U	0.4	
Toluene	108-88-3	U	0.4	
Chlorobenzene	108-90-7	U	0.4	
Ethyl Benzene	100-41-4	υ	0.4	
Total Xylenes	108-38-3, 106-42-3	U	0.4	
(m, p & o)	and 95-47-6			
1,3,5-Trimethylbenzene	108-67-8	U	0.4	
1,2,4-Trimethylbenzene	95-63-6	υ	0.4	
1,2,3-Trimethylbenzene	526-73-8	U	0.4	
1,2,3,4-Tetramethylbenzene	488-23-3	υ	0.4	
Surrogate Recovery (α,α,α-Trifluo	protoluene):	94%	70%-130% (QC	limits)

Note: Total Xylenes consist of three isomers, two of which co-elute. The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

B = Compound also found in the blank.

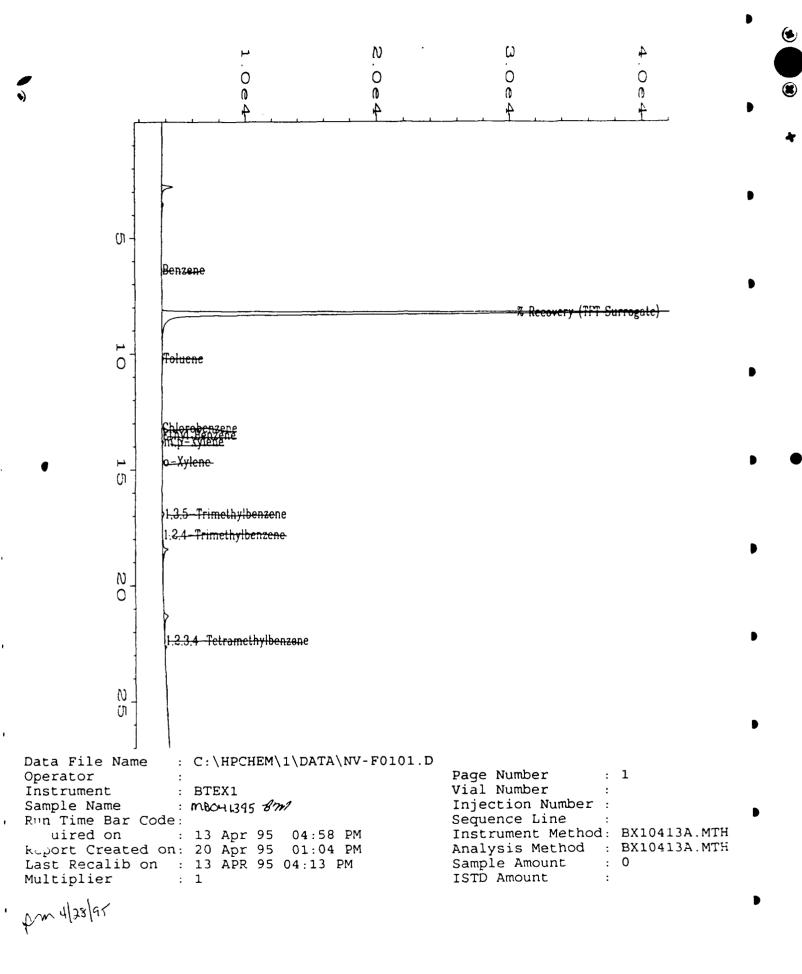
RL = Reporting Limit.

NA = Not Available/Not Applicable.

Approved

BTEX1063 XLS

K. Conc



Method 602 Data Report Method Blank Report

Method Blank Number

: MB041495

Client Project No.

: 722450.21020/Mac D

Date Prepared

: 4/14/95

Lab Project No.

: 95-1063

Date Analyzed

: 4/14/95

Dilution Factor

: 1.00

Method

: 602/8020

Matrix

: Water

Lab File No.

: BX1041340

		Sample		
Compound Name	Cas Number	Concentration	RL	
		ug/L	ug/L	
Benzene	71-43-2	U	0.4	·
Toluene	108-88-3	U	0.4	
Chlorobenzene	108-90-7	U	0.4	1
Ethyl Benzene	100-41-4	U	0.4	•
Total Xylenes	108-38-3, 106-42-3	U	0.4	
(m, p & o)	and 95-47-6			
1,3,5-Trimethylbenzene	108-67-8	U	0.4	ſ
1,2,4-Trimethylbenzene	95-63-6	U	0.4	
1,2,3-Trimethylbenzene	526-73-8	U	0.4	
1,2,3,4-Tetramethylbenzene	488-23-3	U	0.4	(
Surrogate Recovery (α,α,α-Trifluo	rotoluene):	99%	70%-130% (QC limits)	

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

B = Compound also found in the blank.

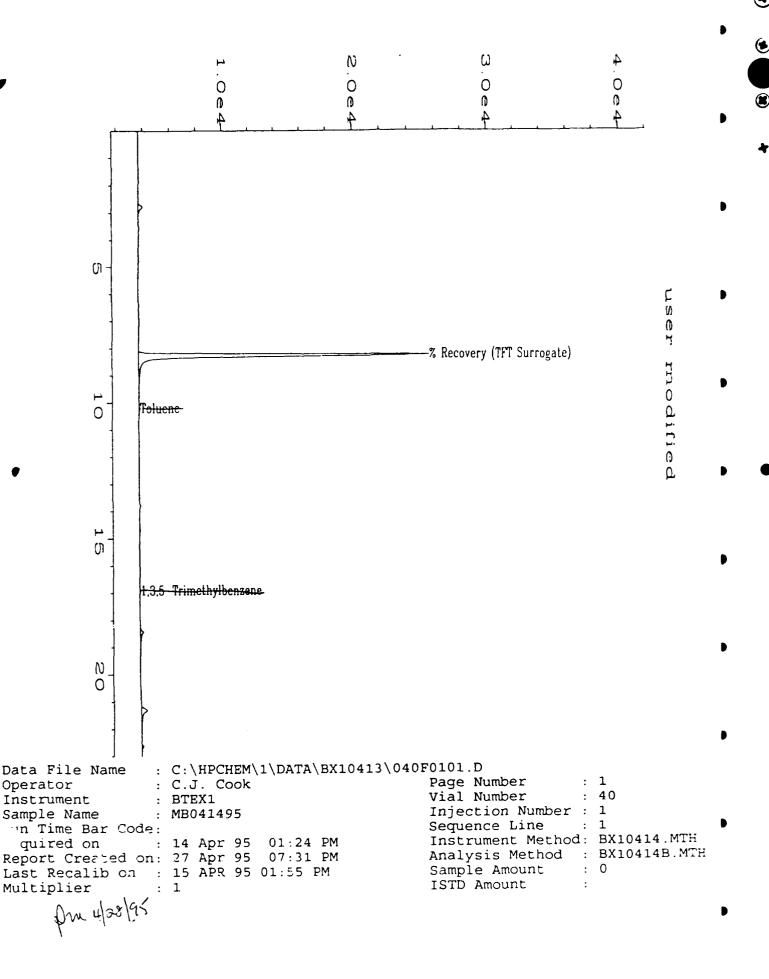
RL = Reporting Limit.

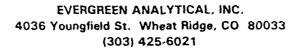
NA = Not Available/Not Applicable.

Analyst

Approved

BTEX1063 XLS





BTEX Data Report Laboratory Control Sample (LCS)

LCS Number : LCS041395
Date Extracted/Prepared : 4/13/95
Date Analyzed : 4/13/95
Spike Amount (ug/L) : 20.0

Dilution Factor Method Matrix Lab File No.

: 602 : Water : BX1041308

: 1.00

LCS LCS Compound Name Cas Concentration % QC Limit Number ug/L Recovery % Recovery Benzene 71-43-2 16.3 71.0-119.0* 81.5 Toluene 108-88-3 17.0 85.0 73.0-111.0* Chlorobenzene 108-90-7 17.3 86.5 64.0-119.0* Ethyl Benzene 100-41-4 17.3 86.5 75.0-114.0* 17.1 85.5 75.0-114.0* m,p-Xylene 108-38-3 106-42-3 95-47-6 16.9 84.5 64.0-119 o-Xylene 1,3,5-Trimethylbenzene 108-67-8 17.8 89.0 50.0-150.0 1,2,4-Trimethylbenzene 95-63-6 18.4 92.0 50.0-150.0 50.0-150.0 1,2,3-Trimethylbenzene 21.3 106.5 526-73-8 89.0 50.0-150.0 1,2,3,4-Tetramethylbenzene 17.8 488-23-3 Surrogate Recovery (\alpha,\alpha,\alpha-Trifluorotoluene): 91% 70%-130% (QC limits)

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

B = Compound found in blank and sample. Compare blank and sample data.

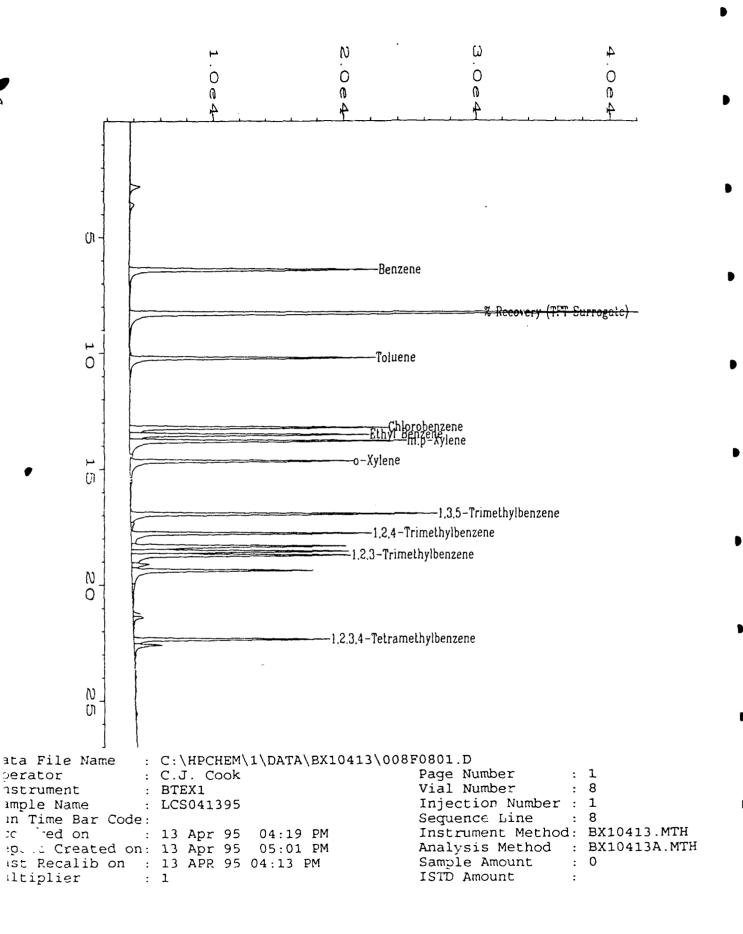
J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

NA = Not available/Not analyzed.

Analyst

Approved

^{* =} Limits established 4/3/95 KSC



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BTEX Data Report Laboratory Control Sample (LCS)

LCS Number : LCS041495 **Dilution Factor** : 1.00 Date Extracted/Prepared 4/14/95 Method 602 Matrix **Date Analyzed** : 4/14/95 Water Lab File No. : BX1041339 Spike Amount (ug/L) : 20.0

LCS LCS Concentration QC Limit Compound Name Cas % % Recovery Number ug/L Recovery 71-43-2 Benzene 15.8 79.0 71.0-119.0* 73.0-111.0* Toluene 108-88-3 16.3 81.5 Chlorobenzene 108-90-7 16.1 80.5 64.0-119.0* 81.5 75.0-114.0* **Ethyl Benzene** 100-41-4 16.3 0.88 75.0-114.0* 108-38-3 17.6 m,p-Xylene 106-42-3 15.7 78.5 64.0-11 o-Xylene 95-47-6 1,3,5-Trimethylbenzene 108-67-8 16.5 82.5 50.0-150.0 84.0 50.0-150.0 1,2,4-Trimethylbenzene 16.8 95-63-6 19.5 97.5 50.0-150.0 1,2,3-Trimethylbenzene 526-73-8

15.0

104%

1,2,3,4-Tetramethylbenzene

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

Surrogate Recovery $(\alpha,\alpha,\alpha$ -Trifluorotoluene):

B = Compound found in blank and sample. Compare blank and sample data.

J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

488-23-3

NA = Not available/Not analyzed.

Analyst

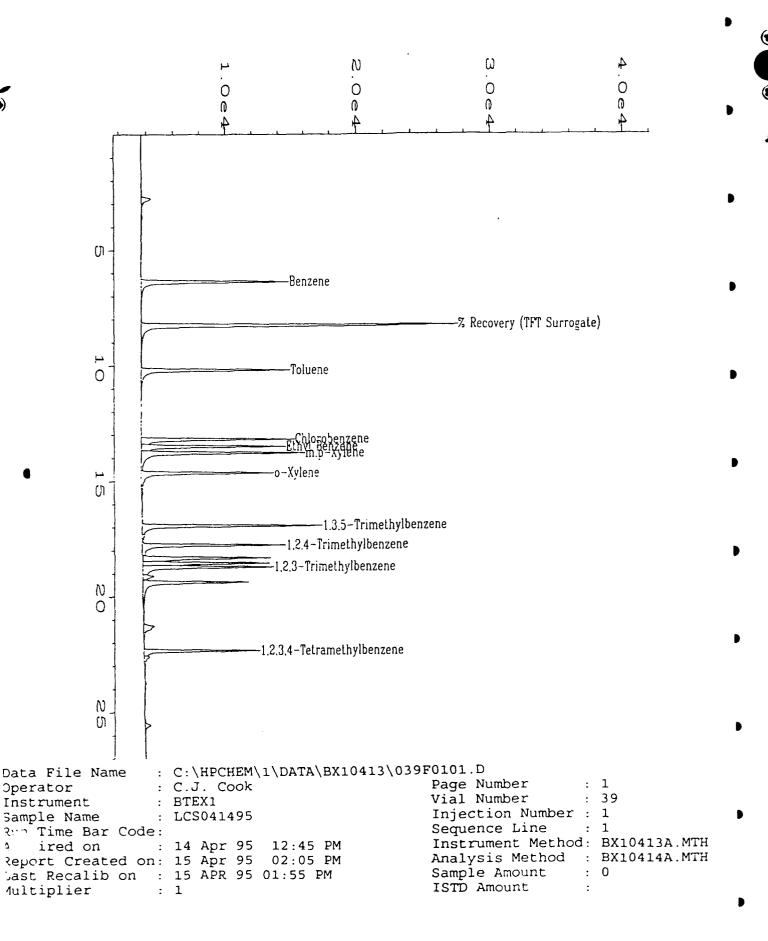
Approved

75.0

70%-130% (QC limits)

50.0-150.0

^{* =} Limits established 4/3/95 KSC



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Date Sampled : 3/31/95
Date Received : 4/1/95

Date Prepared

: 4/1/95 Lab F : 4/14/95 Matri

Client Project Number : 722450.21020/MACDILL Lab Project Number : 95-1063

Matrix : Water

Date Analyzed : 4/14/95 Method Number : 5030/Mod.8015

Evergreen	Client	Surrogate	TVH	RL
Sample #	Sample #	Recovery	mg/L	mg/L
MB041495	METHOD BLANK	100%	U	0.1
X05167	MD75-MW16	95%	0.7	0.1
X05168	75MP-2S	95%	1.8	0.1
X05169	MD75-MW12	99%	0.6	0.1
X05171	MD75-MW3	97%	0.2	0.1
X05172	MD75-MW8	92%	2.0	0.1
X05173	MD75-MW14	94%	3.5	0.1
X05174	75MP-4S	96%	2.6	0.1
X05175	MD75-MW4	100%	2.9	0.1
X05176	MD75-MW24	101%	3.5	0.1
X05177	MD75-MW6	100%	0.1	0.1
X05177 DUP	MD75-MW6	95%	0.1	0.1

QUALIFIERS

U = TVH analyzed for but not detected.

B = TVH found in blank.

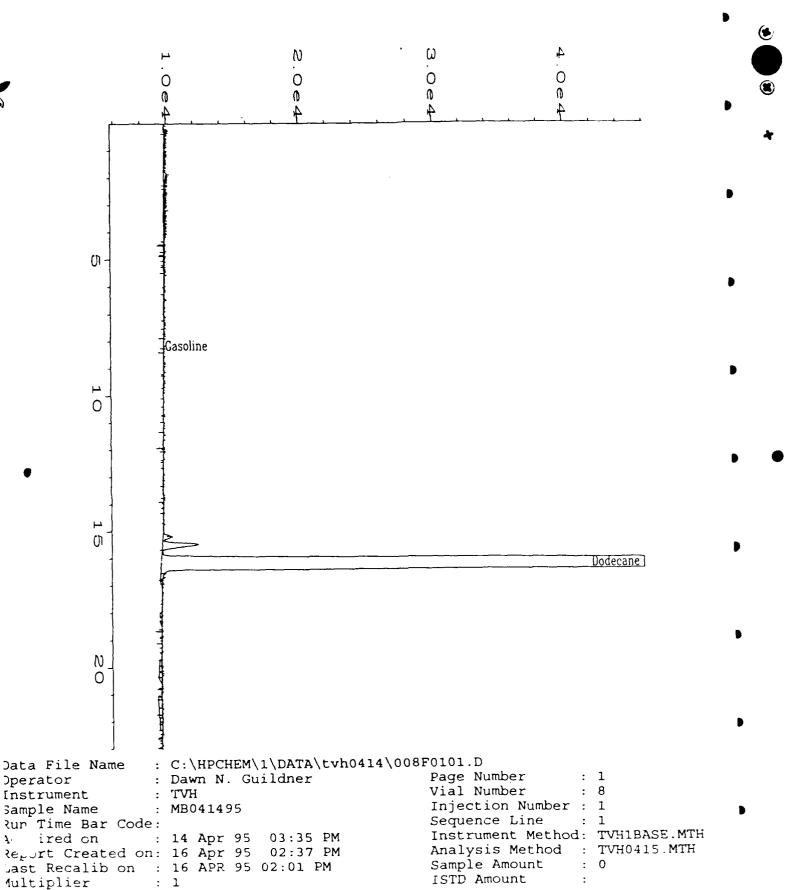
E = Extrapolated value.

RL = Reporting Limit.

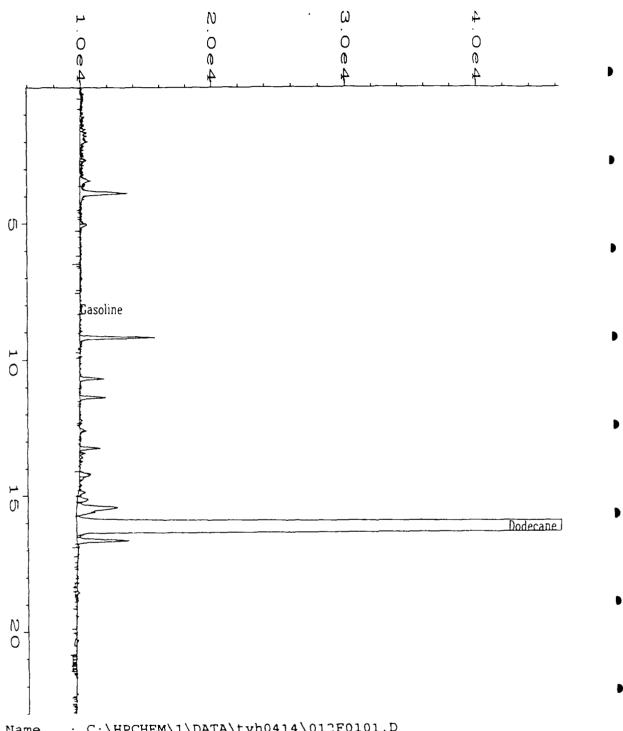
Analyst

Approved

TVH1063.XLS

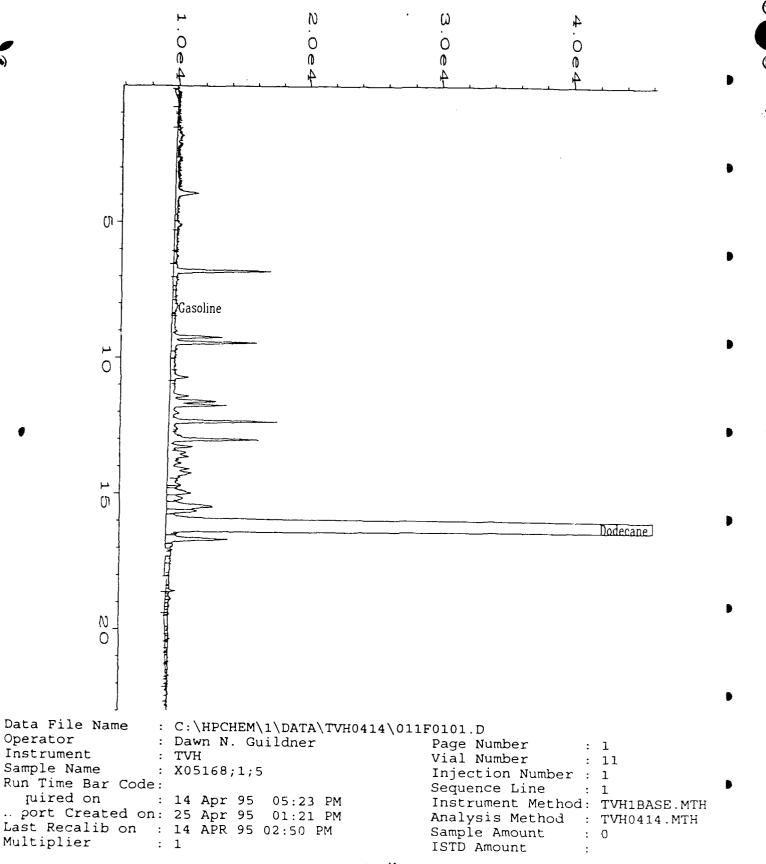


• • •

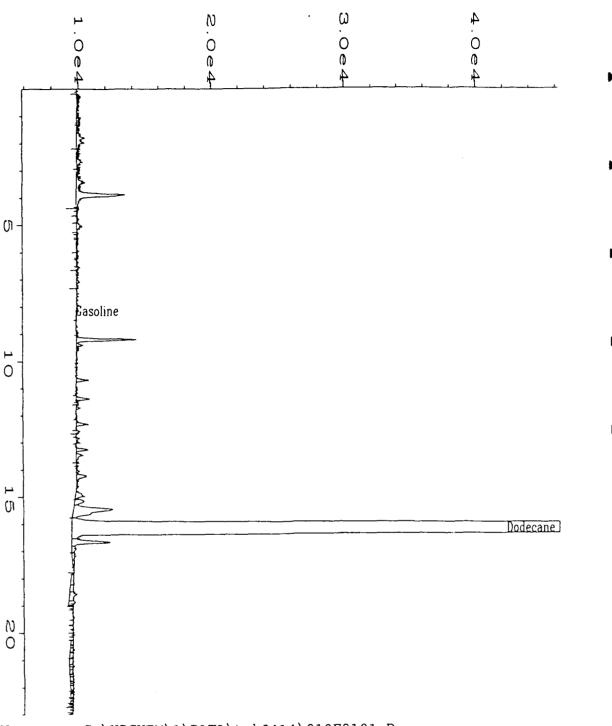


*

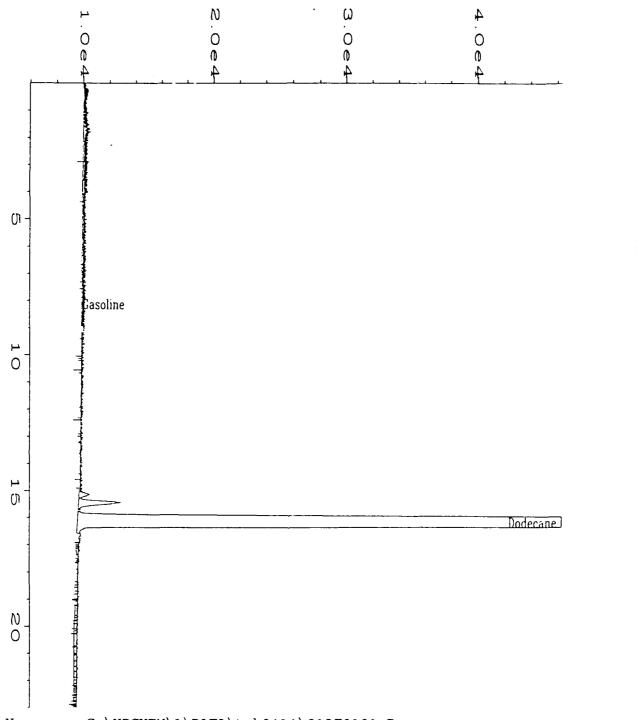
Data File Name :	C:\HPCHEM\1\DATA\tvh0414\012	F0101.D
Operator :	Dawn N. Guildner	Page Number : 1
Instrument :		Vial Number : 12
Sample Name :		Injection Number : 1
Run Time Bar Code:		Sequence Line : 1
	14 Apr 95 05:59 PM	Instrument Method: TVH1BA:
	16 Apr 95 02:37 PM	Analysis Method : TVH0415 MT
	16 APR 95 02:01 PM	Sample Amount : 0
Multiplier :		ISTD Amount :
Sample Info :	PROJECT # 95-1063 CLIENT # M	D75-MW16 WATER



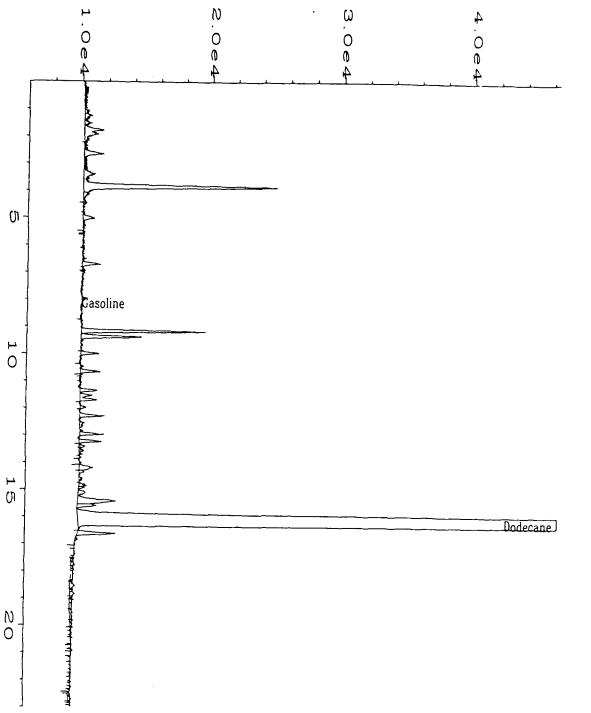
Wient # 75MP-25



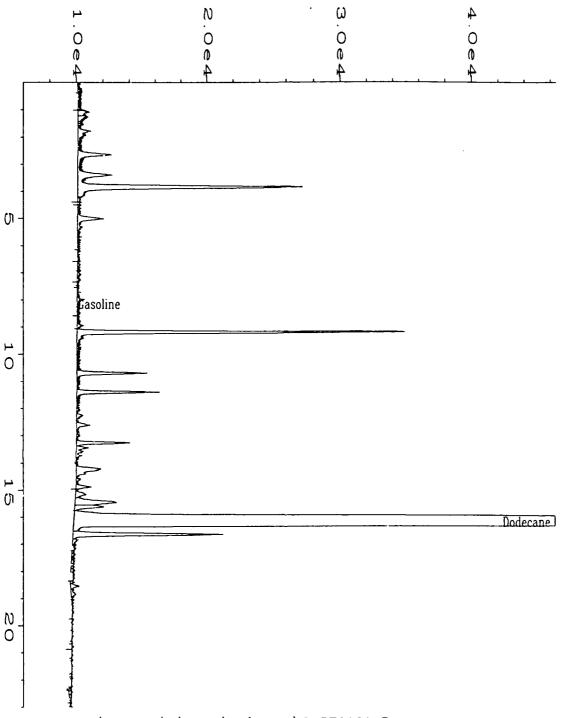
: C:\HPCHEM\1\DATA\tvh0414\010F0101.D Data File Name Page Number Operator : Dawn N. Guildner Vial Number : 10 Instrument : TVH Injection Number: 1 Sample Name : X05169;1;5 : 1 Sequence Line Run Time Bar Code: Instrument Method: TVH1BA: : 14 Apr 95 04:47 PM Acquired on Analysis Method : TVH0415.MT Report Created on: 16 Apr 95 02:37 PM Sample Amount : 0 Last Recalib on : 16 APR 95 02:01 PM ISTD Amount Multiplier : PROJECT # 95-1063 CLIENT # MD75-MW12 WATER Sample Info



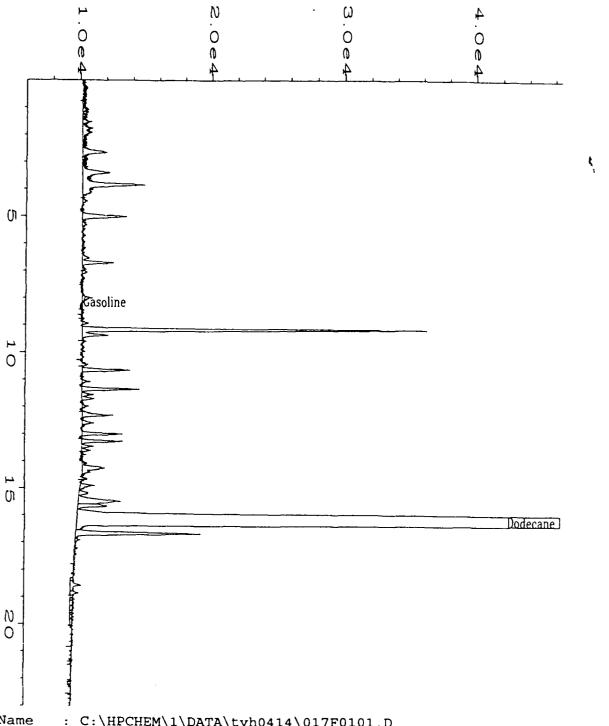
Data File Name : C:\HPCHEM\1\DATA\tvh0414\013F0101.D Operator : Dawn N. Guildner Page Number Instrument : TVH Vial Number : 13 : X05171;1;5 Sample Name Injection Number: 1 Pun Time Bar Code: : 1 Sequence Line : 14 Apr 95 06:35 PM quired on Instrument Method: TVH1BASE.MTH Report Created on: 16 Apr 95 02:38 PM Last Recalib on : 16 APR 95 02:01 PM Analysis Method : TVH0415.MTH Sample Amount : 0 Multiplier : 1 ISTD Amount Sample Info : PROJECT # 95-1063 CLIENT # MD75-MW3 WATER



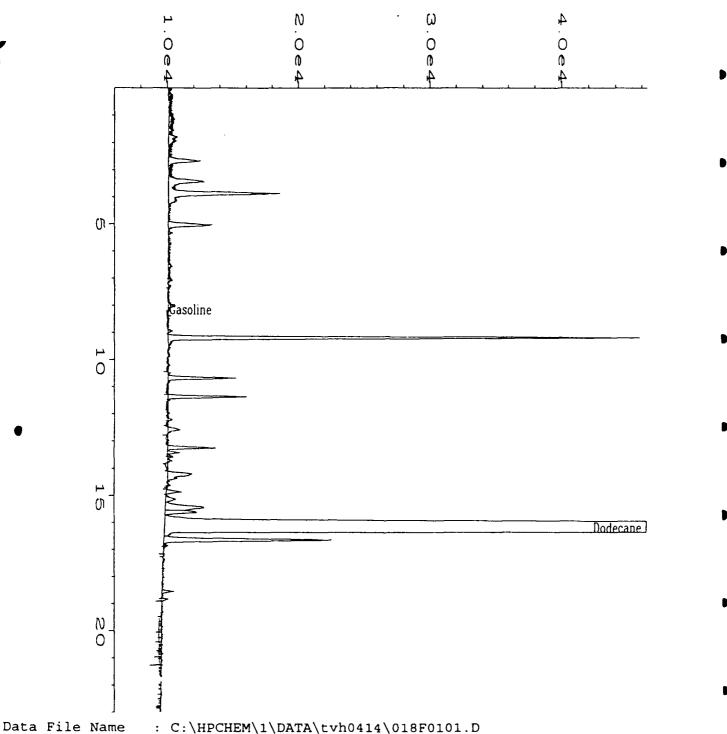
Data File Name : C:\HPCHEM\1\DATA\tvh0414\014F0101.D Operator : Dawn N. Guildner Page Number Vial Number : 1 Instrument : TVH : 14 Sample Name : X05172;1;5 Injection Number: 1 Run Time Bar Code: Sequence Line : 1 Acquired on : 14 Apr 95 07:11 PM Report Created on: 16 Apr 95 02:38 PM Instrument Method: TVH1BAS Analysis Method : TVH0415.MT Last Recalib on : 16 APR 95 02:01 PM Sample Amount : 0 Multiplier : 1 ISTD Amount Sample Info : PROJECT # 95-1063 CLIENT # MD75-MW8 WATER



```
Data File Name
                 : C:\HPCHEM\1\DATA\tvh0414\015F0101.D
Operator
                 : Dawn N. Guildner
                                                Page Number
Instrument
                 : TVH
                                                Vial Number
Sample Name
                                                Injection Number: 1
                 : X05173;1;5
 `n Time Bar Code:
                                                Sequence Line
 quired on
                : 14 Apr 95 07:47 PM
                                                Instrument Method: TVH1BASE.MTH
Report Created on: 16 Apr 95 02:38 PM
                                                Analysis Method : TVH0415.MTH
Last Recalib on : 16 APR 95 02:01 PM
                                                Sample Amount
                 : 1
                                                ISTD Amount
Multiplier
Sample Info
                : PROJECT # 95-1063 CLIENT # MD75-MW14 WATER
```

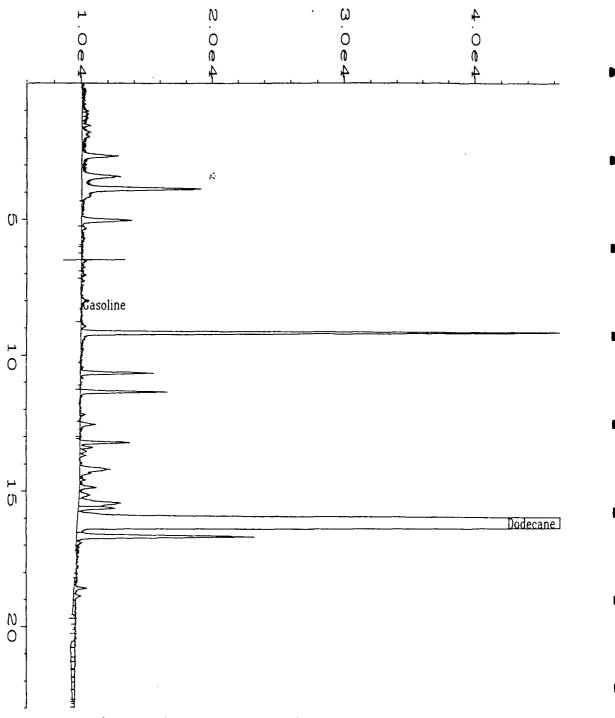


Data File Name : C:\HPCHEM\1\DATA\tvh0414\017F0101.D Operator : Dawn N. Guildner Page Number Instrument : TVH Vial Number : 17 Sample Name : X05174;1;5 Injection Number: 1 Run Time Bar Code: Sequence Line : 1 Acquired on : 14 Apr 95 08:59 PM Instrument Method: TVH1BAS Report Created on: 16 Apr 95 02:39 PM Analysis Method : TVH0415.MT Last Recalib on : 16 APR 95 02:01 PM Sample Amount Multiplier : 1 ISTD Amount Sample Info : PROJECT # 95-1063 CLIENT # 75MP-4S WATER

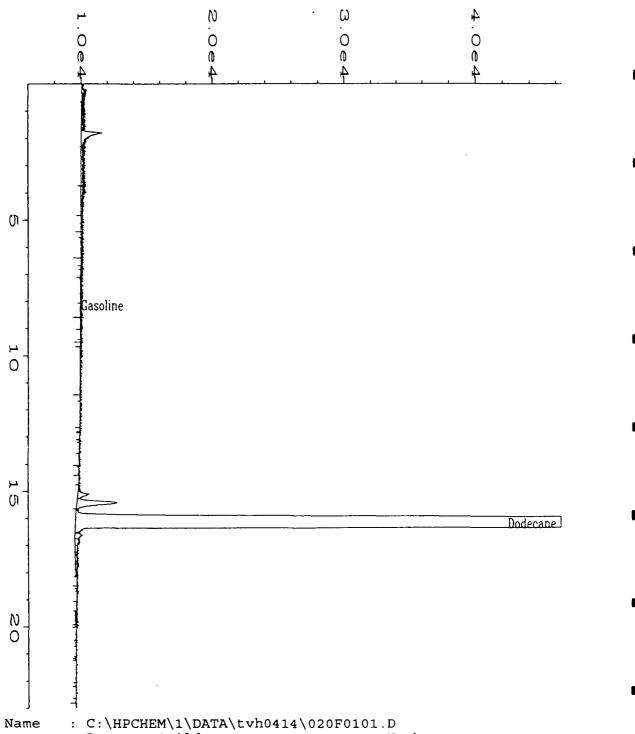


Operator : Dawn N. Guildner Page Number Instrument Vial Number : TVH : 18 Sample Name : X05175;1;5 Injection Number: 1 Pun Time Bar Code: Sequence Line : 1 quired on : 14 Apr 95 09:35 PM Instrument Method: TVH1BASE.MTH Report Created on: 16 Apr 95 02:39 PM Analysis Method : TVH0415.MTH Last Recalib on : 16 APR 95 02:01 PM Sample Amount : 0 Multiplier ISTD Amount : 1

Sample Info : PROJECT # 95-1063 CLIENT # MD75-MW4 WATER

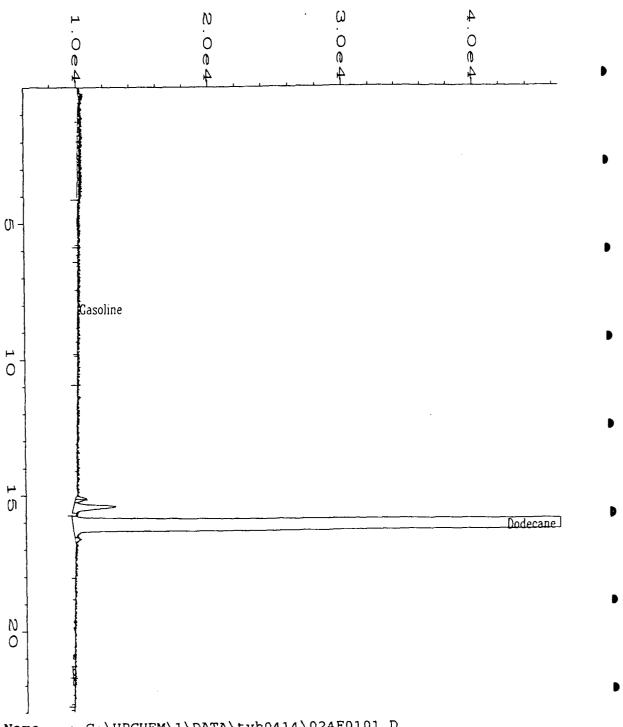


Data File Name	:	C:\HPCHEM\1\DATA\tvh0414\0)19F0101.D
Operator			Page Number : 1
Instrument	:	TVH	Vial Number : 19
Sample Name		X05176;1;5	Injection Number : 1
Run Time Bar Code	:		Sequence Line : 1
Acquired on	:	14 Apr 95 10:11 PM	Instrument Method: TVH1BA: :
		16 Apr 95 02:39 PM	Analysis Method : TVH0415.MT
Last Recalib on	:	16 APR 95 02:01 PM	Sample Amount : 0
		1	ISTD Amount :
Sample Info	:	PROJECT # 95-1063 CLIENT #	# MD75-MW24 WATER



Data File Name Operator : Dawn N. Guildner Page Number Instrument : TVH Vial Number Sample Name : X05177;1;5 Injection Number : 1 Sequence Line oun Time Bar Code: : 1 quired on : 14 Apr 95 10:47 PM Instrument Method: TVH1BASE.MTF Report Created on: 16 Apr 95 02:39 PM Analysis Method : TVH0415.MTH Last Recalib on : 16 APR 95 02:01 PM Sample Amount Multiplier ISTD Amount

Sample Info : PROJECT # 95-1063 CLIENT # MD75-MW6 WATER



Data File Name	:	C:\HPCHEM\1\DATA\tvh0414\024	F0101.D
		Dawn N. Guildner	Page Number : 1
Instrument			Vial Number : 24
Sample Name			Injection Number : 1
Run Time Bar Code			Sequence Line : 1
		15 Apr 95 01:11 AM	Instrument Method: TVH1BA.
		16 Apr 95 02:39 PM	Analysis Method : TVH0415.MI
Last Recalib on	:	16 APR 95 02:01 PM	Sample Amount : 0
Multiplier			ISTD Amount :

(





TOTAL VOLATILE HYDROCARBONS (TVH) Laboratory Control Sample (LCS)

LCS Number

: LCS041495

Matrix

: WATER

Date Prepared
Date Analyzed

: 4/14/95 : 4/14/95 Method Number

: 5030/MOD.8015

Sequence Number

: TVH7

Compound Name Theoretical Concentration mg/L LCS Concentration mg/ L LCS % Recovery

QC Limit
% Recovery

Gasoline

5.00

4.93

99%

70%-130%

QUALIFIERS

U = TVH analyzed for but not detected.

B = TVH found in blank as well as sample (blank data should be compared).

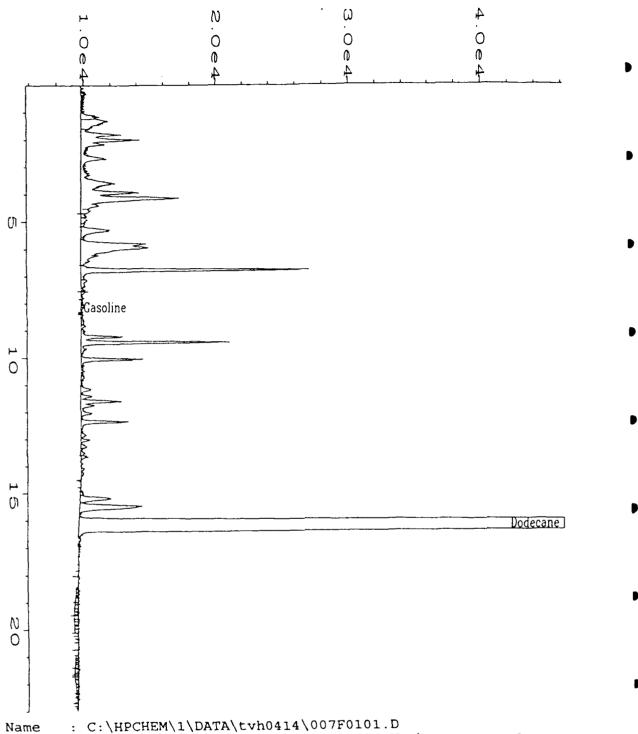
E = Extrapolated value.

NA = Not Available.

Analyst

Approved

D



Data File Name Page Number : Dawn N. Guildner Operator Vial Number Instrument TVH Injection Number: 1 Sample Name : LCS041495 Sequence Line : 1 Run Time Bar Code: Instrument Method: TVH1BASE : 14 Apr 95 02:59 PM Acquired on Analysis Method : TVH0415.MTH Report Created on: 16 Apr 95 02:37 PM Sample Amount : 0 Last Recalib on : 16 APR 95 02:01 PM ISTD Amount Multiplier



TOTAL EXTRACTABLE HYDROCARBONS (TEH, as JET FUEL)

Date Sampled

: 3/31/95

Client Project Number

: 722450-21020

Date Received

: 4/1/95

Lab Project Number

: 95-1063 : Water

Date Prepared Date Analyzed

: 4/3/95 : 4/4,5,6/95 Matrix Method Number

: 3500/Mod.8015

Evergreen	Client	Surrogate	TEH	RL
Sample #	Sample #	Recovery	mg/L	mg/L
WB040395	WATER BLANK	75%	U	0.5
X05169	MD75-MW12	94%	3.1	0.5
X05172	MD75-MW8	110%	14	0.5
X05175	MD75-MW4	77%	15	0.5
X05178	24MP-2S	47%	4.0	0.5
X05178-R	24MP-2S	47%	3.9	0.5
X05179	MD24-MW6	61%	1.4	0.5
X05179-R	MD24-MW6	61%	1.3	0.5
X05183	MD24-MW2	45%	υ,	0.5
X05183-R	MD24-MW2	43%	U	0.5
X05184	MD24-MW26	53%	1.2	0.5
X05184-R	MD24-MW26	58%	1.4	0.5
X05185	MS/MSD	46%	U	0.5
X05185-R	MS/MSD	44%	U	0.5

QUALIFIERS

U = TEH analyzed for but not detected.

B = TEH found in blank.

E = Extrapolated value.

RL = Reporting Limit

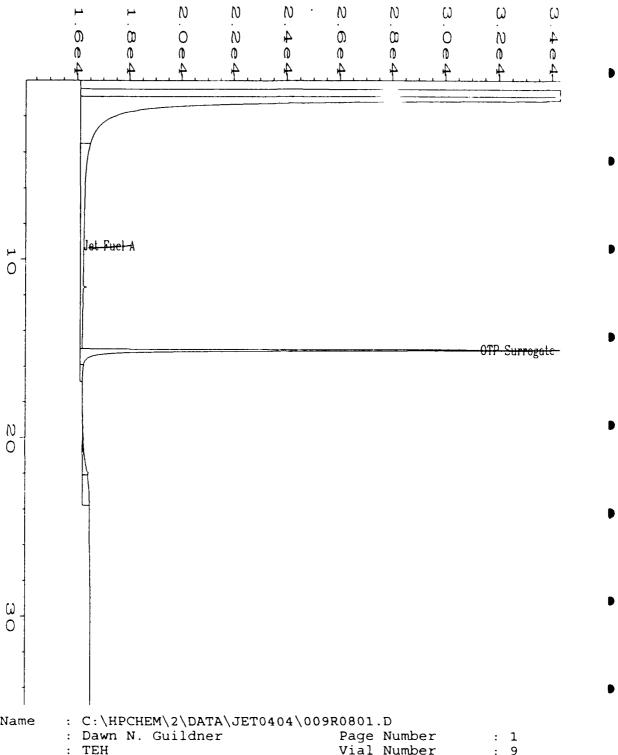
R = Reanalysis of original sample extract.

Analyst

Approved

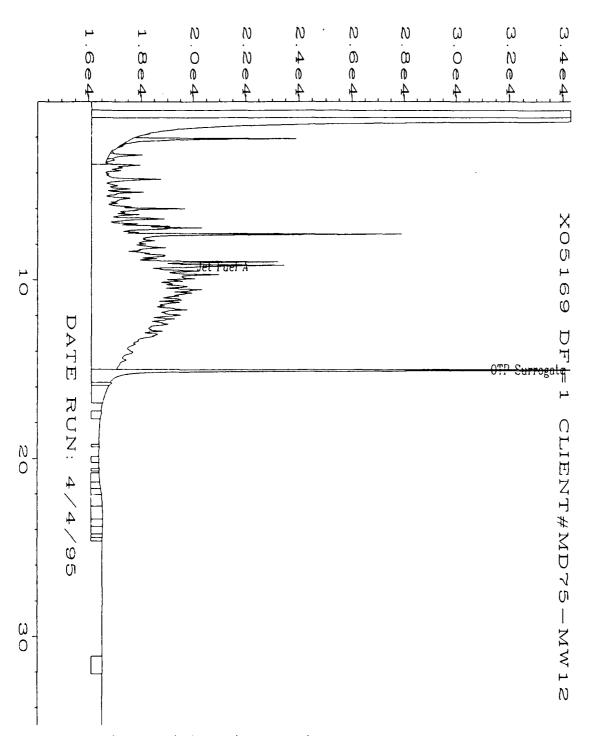
1 Clella

TEH1063 XLS

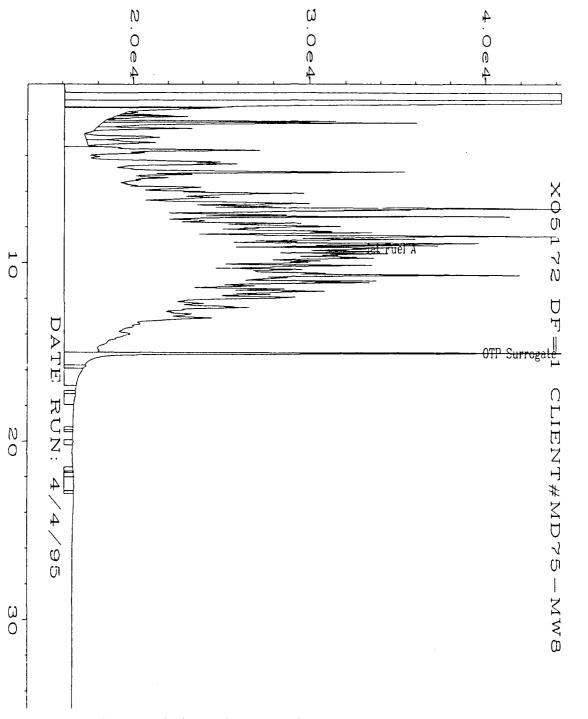


Data File Name Operator Instrument Vial Number : TEH Sample Name : WB040395 Injection Number : 1 Run Time Bar Code: : 8 Sequence Line Acquired on : 04 Apr 95 06:13 PM Instrument Method: JET040 Report Created on: 05 Apr 95 01:33 PM Analysis Method : JET0404.M' Last Recalib on : 05 APR 95 10:34 AM Sample Amount : 0 Multiplier ISTD Amount

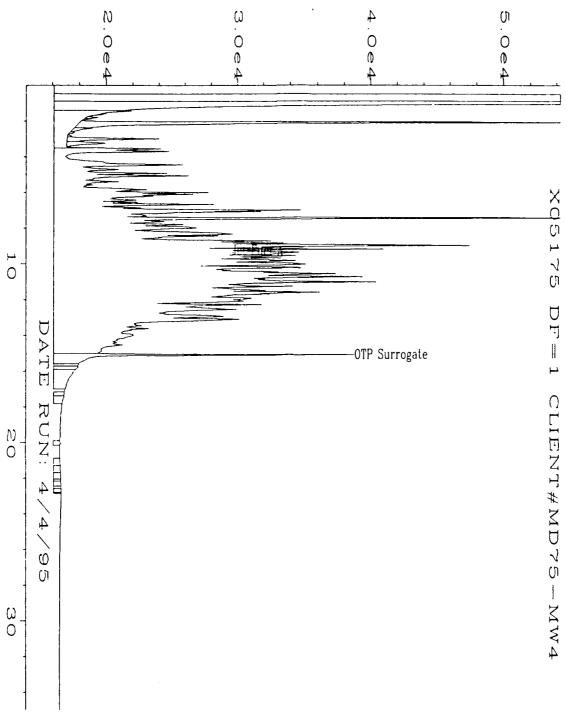
1 1/2/9/



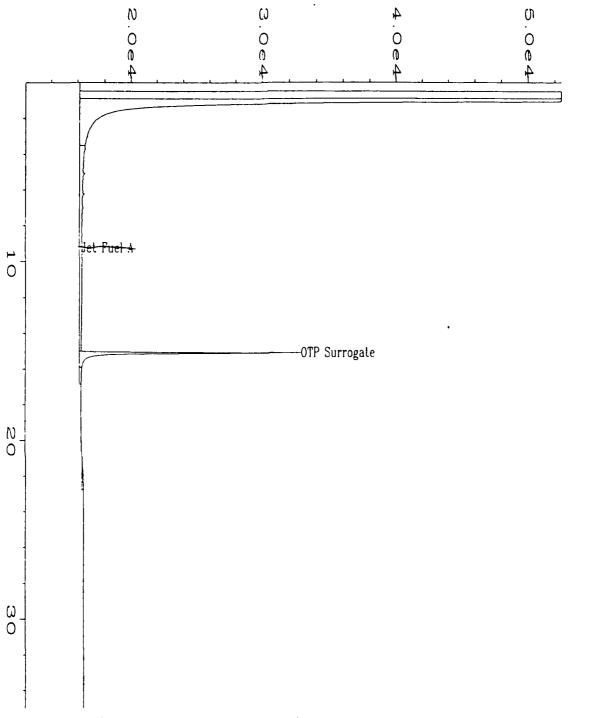
Data File Name : C:\HPCHEM\2\DATA\JET0404\011R0801.D Operator : Dawn N. Guildner Page Number Instrument : TEH Vial Number : 11 Sample Name : X05169 DF≈1 Injection Number : 1 Tun Time Bar Code: Sequence Line : 8 : 04 Apr 95 07:53 PM quired on Instrument Method: JET0404.MTH Report Created on: 05 Apr 95 01:35 PM Analysis Method : JET0404.MTH Last Recalib on : 05 APR 95 10:34 AM Sample Amount : 0 Multiplier ISTD Amount



Data File Name : C:\HPCHEM\2\DATA\JET0404\012R0801.D Operator : Dawn N. Guildner Page Number Instrument Vial Number : TEH Injection Number : 1 Sample Name : X05172 DF=1 Run Time Bar Code: Sequence Line : 8 Acquired on : 04 Apr 95 08:42 PM Instrument Method: JET040. Report Created on: 05 Apr 95 01:38 PM Analysis Method : JET0404.MI Last Recalib on : 05 APR 95 10:34 AM Sample Amount : 0 Multiplier ISTD Amount



Data File Name : C:\HPCHEM\2\DATA\JET0404\013R0801.D Operator : Dawn N. Guildner Page Number : 1 Instrument : TEH Vial Number : 13 Sample Name : X05175 DF=1 Injection Number : 1 : 8 Sequence Line n Time Bar Code: : 04 Apr 95 09:32 PM Instrument Method: JET0404.MTH Report Created on: 05 Apr 95 01:39 PM Analysis Method : JET0404.MTH Last Recalib on : 05 APR 95 10:34 AM Sample Amount : 0 Multiplier ISTD Amount



Data File Name : C:\HPCHEM\2\DATA\jet0405\021R0101.D Operator Page Number : Dawn N. Guildner Instrument Vial Number : 21 : TEH Sample Name : X05185 DF=1 Injection Number: 1 Run Time Bar Code: Sequence Line : 1 Acquired on : 06 Apr 95 03:30 AM Instrument Method: FID1BAS. .: Report Created on: 14 Apr 95 12:27 PM Analysis Method : JET0405.MT Last Recalib on : 06 APR 95 08:59 AM Sample Amount Multiplier : 1 ISTD Amount Sample Info : PROJECT # 95-1063 CLIENT # MS/MSD WATER

Ern 4/33/95

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0
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              Jet Fuel A
0
                                               OTP Surrogate
20
ω
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Data File Name
               : C:\HPCHEM\2\DATA\jet0405\030R0101.D
Operator
                 : Dawn N. Guildner
                                               Page Number
Instrument
                 : TEH
                                               Vial Number
Sample Name
                 : X05185 DF=1 -R
                                               Injection Number: 1
n Time Bar Code:
                                               Sequence Line
                                                                : 1
  quired on
                : 06 Apr 95 04:11 PM
                                               Instrument Method: FID1BASE.MTH
port Created on: 07 Apr 95 10:20 AM
                                               Analysis Method : JET0405.MTH
Last Recalib on : 06 APR 95 08:59 AM
                                               Sample Amount
Multiplier
                 : 1
                                               ISTD Amount
Sample Info
                 : PROJECT # 95-1063 CLIENT # MS/MSD WATER
```

24/45/h mg

EVERGREEN ANALYTICAL, INC. 4036 Youngfield, Wheat Ridge, CO 80033 (303) 425-6021

TOTAL EXTRACTABLE HYDROCARBONS (TEH) Laboratory Control Sample (LCS)

LCS Number

: LCS040495

Matrix

: WATER

Date Prepared

: 4/3/95

Method Number

: 3500/MOD.8015

Date Analyzed

: 4/5/95

Sequence Number

: JET10

Compound Name	Theoretical Concentration mg/L	LCS Concentration mg/ L	LCS % Recovery	QC Limit % Recovery
JET FUEL	1000	855	86%	70%-130%

QUALIFIERS

U = TEH analyzed for but not detected.

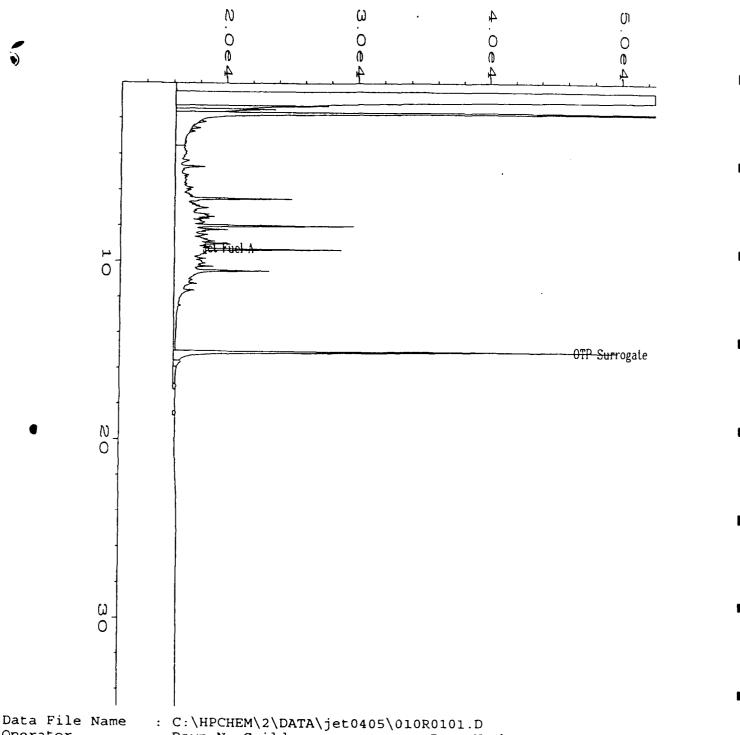
B = TEH found in blank as well as sample (blank data should be compared).

E = Extrapolated value.

NA = Not Available.

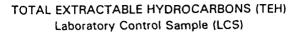
Approved

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Operator : Dawn N. Guildner Page Number Instrument : TEH Vial Number : 10 -R Sample Name : LCS040495 Injection Number: 1 Run Time Bar Code: Sequence Line : 1 'ired on : 05 Apr 95 06:22 PM Instrument Method: FID1BASE.MTH ort Created on: 06 Apr 95 08:56 AM Analysis Method : JET0405.MTH Last Recalib on : 06 APR 95 08:52 AM Sample Amount Multiplier : 1 ISTD Amount

EVERGREEN ANALYTICAL, INC. 4036 Youngfield, Wheat Ridge, CO 80033 (303) 425-6021



LCS Number

: LCS040495

Matrix

: WATER

Date Prepared

: 4/3/95

Method Number

: 3500/MOD.8015

Date Analyzed

: 4/4/95

Sequence Number :

: JET10

Compound Name	Theoretical Concentration mg/L	LCS Concentration mg/ L	LCS % Recovery	QC Limit % Recovery
JET FUEL	1000	834	83%	70%-130%

QUALIFIERS

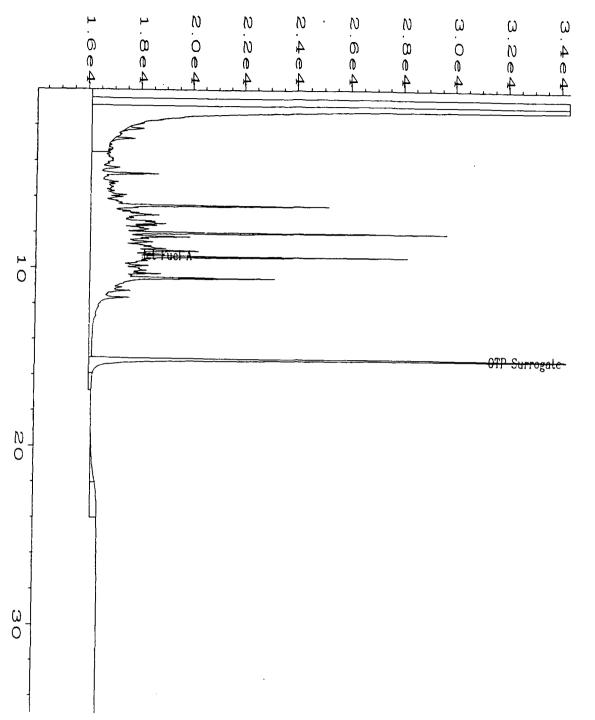
U = TEH analyzed for but not detected.

B = TEH found in blank as well as sample (blank data should be compared).

E = Extrapolated value.

NA = Not Available.

Approved



Data File Name : C:\HPCHEM\2\DATA\JET0404\010R0801.D Operator : Dawn N. Guildner Page Number Vial Number Instrument : TEH Sample Name : LCS040495 Injection Number : 1 Dun Time Bar Code: Sequence Line : 8 quired on : 04 Apr 95 07:03 PM Instrument Method: JET0404.MTH Report Created on: 05 Apr 95 01:33 PM Analysis Method : JET0404.MTH Last Recalib on : 05 APR 95 10:34 AM Sample Amount Multiplier : 1 ISTD Amount

EVERGREEN ANALYTICAL, INC. 4036 Youngfield St. Wheat Ridge, CO 80033 (303)425-6021

Miscellaneous Analyses

Evergreen <u>Sample #</u>	Client <u>Sample ID</u>	<u>Matrix</u>	Chloride (mg/L)
X05167	MD75-MW16	Water	9.51
X05168	75MP-2S	Water	13.4
X05169	MD75-MW12	Water	11.0
X05171	MD75-MW3	Water	10.0
X05172	MD75-MW8	Water	14.4
X05173	MD75-MW14	Water	13.5
X05174	75MP-4S	Water	24.8
X05175	MD75-MW4	Water	16.8
X05176	MD75-MW24	Water	16.0
X05177	MD75-MW6	Water	7.37
X05177 dup	MD75-MW6 dup	Water	7.26

Method Blank (4/1/95) <0.250

Quality Assurance

	True Value (mg/L)	Result (mg/L)	% Recovery
Alltech Anion Mixture A Lot #J-I0N01134	20.0	18.8	94.0

Dela V. Byen Analyst

Approved

EVERGREEN ANALYTICAL, INC. 4036 Youngfield St. Wheat Ridge, CO 80033 (303)425-6021

Miscellaneous Analyses

722450-21020

Date Sampled : 3/31/95 Client Project ID. : /MacDill AFB Date Received : 4/1/95 Lab Project No. : 95-1063

Date Received: 4/1/95 Lab Project No. : 95-1063
Date Prepared: 4/1/95 Method : EPA 300.0
Date Analyzed: 4/1/95 Detection Limit : 0.076 mg/L

Evergreen <u>Sample</u> #	Client <u>Sample ID</u>	<u>Matrix</u>	Nitrite-N (mg/L)
X05167	MD75-MW16	Water	<0.076
X05168	75MP-2S	Water	<0.076
X05169	MD75-MW12	Water	<0.076
X05171	MD75-MW3	Water	<0.076
X05172	MD75-MW8	Water	<0.076
X05173	MD75-MW14	Water	<0.076
X05174	75MP-4 <i>S</i>	Water	0.125
X05175	MD75-MW4	Water	<0.076
X05176	MD75-MW24	Water	<0.076
X05177	MD75-MW6	Water	<0.076
X05177 dup	MD75-MW6 dup	Water	<0.076

Method Blank (4/1/95)

<0.076

Quality Assurance**

	True Value	Result	%
	(mg/L)	(mg/L)	Recovery
Alltech Anion Mixture A Lot #J-I0N01134	21.0	21.6	103

** = Quality assurance results reported as Nitrite (NO,)

lyst Approved

EVERGREEN ANALYTICAL, INC. 4036 Youngfield St. Wheat Ridge, CO 80033 (303)425-6021

Miscellaneous Analyses

7	2	2	4	5	0	-	2	1	0	2	0	
						_						

Date Sampled	:	3/31/95	Client Project ID.	:	/MacDill AFB
Date Received	:	4/1/95	Lab Project No.	:	95-1063
Date Prepared	:	4/1/95	Method	:	EPA 300.0

Date Prepared: 4/1/95 Method: EPA 300.0
Date Analyzed: 4/1/95 Detection Limit: 0.056 mg/L

Evergreen Sample #	Client <u>Sample ID</u>	<u>Matrix</u>	Nitrate-N (mg/L)
X05167	MD75-MW16	Water	<0.056
X05168	75MP-2S	Water	0.060
X05169	MD75-MW12	Water	<0.056
X05171	MD75-MW3	Water	<0.056
X05172	MD75-MW8	Water	0.070
X05173	MD75-MW14	Water	0.072
X05174	75MP-4S	Water	0.069
X05175	MD75-MW4	Water	0.082
X05176	MD75-MW24	Water	0.061
X05177	MD75-MW6	Water	0.162
X05177 dup	MD75-MW6 dup	Water	0.162

Method Blank (4/1/95) <0.056

Quality Assurance**

	True Value (mg/L)	Result (mg/L)	% Recovery
Alltech Anion Mixture A Lot #J-I0N01134	20.0	17.7	88.5

** = Quality assurance results reported as Nitrate (NO₃)

Approved

EVERGREEN ANALYTICAL, INC. 4036 Youngfield St. Wheat Ridge, CO 80033 (303)425-6021

Miscellaneous Analyses

722450-21020

Date Sampled : 3/31/95 Client Project ID. : /MacDill AFB Date Received : 4/1/95 Lab Project No. : 95-1063

Date Prepared: 4/1/95 Method: EPA 300.0
Date Analyzed: 4/1/95 Detection Limit: 0.250 mg/L

Evergreen <u>Sample #</u>	Client <u>Sample ID</u>	<u>Matrix</u>	Sulfate(mg/L)
X05167	MD75-MW16	Water	1.23
X05168	75MP-2S	Water	3.15
X05169	MD75-MW12	Water	11.3
X05171	MD75-MW3	Water	22.8
X05172	MD75-MW8	Water	1.22
X05173	MD75-MW14	Water	1.92
X05174	75MP-4S	Water	1.82
X05175	MD75-MW4	Water	1.91
X05176	MD75-MW24	Water	1.57
X05177	MD75-MW6	Water	26.6
X05177 dup	MD75-MW6 dup	Water	26.3

Method Blank (4/1/95) <0.250

Quality Assurance

	True Value	Result	%
	(mg/L)	(mg/L)	<u>Recovery</u>
Alltech Anion Mixture A Lot #J-I0N01134	30.0	29.0	96.7

Analyst /

Approved

1063tm 4

EVERGREEN ANALYTICAL, INC. 4036 Youngfield St. Wheat Ridge, CO 80033 (303)425-6021

Miscellaneous Analyses

722450-21020

Date Sampled: 3/31/95 Client Project ID.: /MacDill AFB Date Received: 4/1/95 Lab Project No.: 95-1063

Date Prepared: 4/5/95 Method: EPA 310.1

Date Analyzed: 4/5/95 Detection Limit: 5.00 mgCaCO₃/L

Evergreen Sample #	Client <u>Sample ID</u>	<u>Matrix</u>	Total Alkalinity _(mqCaCO ₃ /L)
X05169	MD75~MW12	Water	18.4
X05171	MD75-MW3	Water	61.5
X05172	MD75-MW8	Water	138
X05172 dup	MD75-MW8 dup	Water	136
X05175	MD75-MW4	Water	300
X05176	MD75-MW24	Water	286

Method Blank (4/5/95) <5.00

Quality Assurance

	True Value	Result	%
	(mgCaCO ₃ /L)	(mgCaCO ₃ /L)	Recovery
APG Minerals Reference	11.8	10.8	91.5

Approved

External Standard Report

Data File Name : C:\HPCHEM\2\DATA\BX20415\014R0101.D

erator	: T. Lockwood	Page Number	:	1
instrument	: BTEX2	Vial Number	:	14
Sample Name	: X05176;50;0.1	Injection Number	:	1
Run Time Bar C	ode:	Sequence Line	:	1

Acquired on : 15 Apr 95 08:36 PM Instrument Method: BX20415.MTH Report Created on: 16 Apr 95 04:42 PM Analysis Method : BX20415A.MTH

Last Recalib on : 16 Apr 95 03:38 PM Sample Amount : 0 Multiplier : 1 X ISTD Amount :

Sig. 2 in $C:\HPCHEM\2\DATA\BX20415\014R0101.D$

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Ret Time	Area	Type	Width	Ref#	ug/L	Name
1	-		l	l	1	
		ı	J	l	1	_ ~ ~ ~
4.660	5594	BB	0.098	1	1.914	Benzene XSO
6.143	86867	VB	0.096	1-R	87.270	TFT Surrogate (% REC.)
7.728	902	VB	0.104	1	0.350	Toluene
10.247	810	BV	0.102	1	0.373	Chlorobenzene
10.493	24823	VV	0.089	1	10.830	Ethyl Benzene ×50
10.741	4517	VB	0.116	1		m, p-Xylene)
11.477	958	BB	0.084	1	0.431	6-Xylene / Ck uso
13.561	724	VB	0.149	1	0.223	1,3,5-Trimethylbenzene
14.531	656	BV	0.113	1	0.296	1,2,4-Trimethylbenzene
i5.354	1942	PV	0.085	1	0.969	1,2,3-Trimethylbenzene
18.173	2698	ΡV	0.079	1	1.446	1,2,3,4-TetramethylbenzeneB

Time Reference Peak	Expected RT	Actual RT	Difference
2	6.120	6.143	0.023

Holling clime up

not used



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External Standard Report

Data File Name : C:\HPCHEM\1\DATA\BX10417\017\F1001.D

rator : C.J. Cook Page Number : 1) listrument : BTEX1 Vial Number : X05175;20;0.250_ Sample Name Injection Number: 1 Run Time Bar Code: Sequence Line : 10

Instrument Method: BX10417A.MTH Acquired on : 17 Apr 95 04:31 PM Report Created on: 17 Apr 95 07:29 PM Analysis Method : BX10417B.MTH

Last Recalib on : 17 APR 95 07:07 PM Sample Amount Multiplier : 20 ISTD Amount

Sample Info : Project#: 95-1063 Client#: MD75-MW4 Water

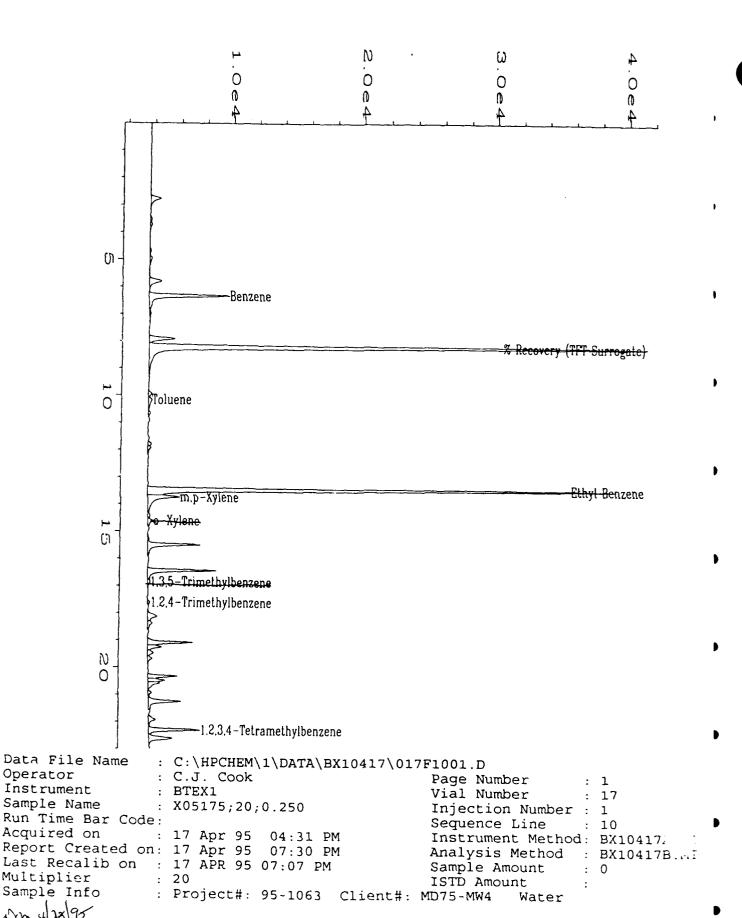
Sig. 1 in C:\HPCHEM\1\DATA\BX10417\017F1001.D

Ret Time	A:	rea	Type	Width	Ref#	ug/L	Name
6.333		43572	VV	0.107	1		Benzene
8.218		261271	VV	0.106	1-R	1699.725	% Recovery (TFT Surrogate) 85%
10.172		3841	VV	0.196	1		Toluene
13.196	* not	found	*		1		Chlorobenzene
13.464		209657	VV	0.091	1	583.727	Ethyl Benzene
13.741		23300	VV	0.134	1	52.583	m,p-Xylene
14.613		3728	VV	0.129	1	9.673	o-Xylene
16.871		1985	VV	0.165	1	4.440	1,3,5-Trimethylbenzene
7.610		1119	ΡV	0.094	1	3.417	1,2,4-Trimethylbenzene
¶8.722	* not	found	*		1		1,2,3-Trimethylbenzene
22.301		22466	VV	0.089	1	92.176	1,2,3,4-Tetramethylbenzene

Difference Time Reference Peak Expected RT Actual RT 8.275 8.218 -0.057 2

Not all calibrated peaks were found

Holding met used for



Dn. 4/28/95

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External Standard Report

Data File Name : C:\HPCHEM\1\DATA\BX10417\016F1001.D

Page Number : 1

Vial Number : 16

Sample Name : X05174(20;0.250 Injection Number : 10

Run Time Bar Code: Sequence Line : 10

Acquired on : 17 Apr 95 03:51 PM Instrument Method: BX10417A.MTH Report Created on: 17 Apr 95 07:28 PM Analysis Method : BX10417B.MTH

Last Recalib on : 17 APR 95 07:07 PM Sample Amount : 0 Multiplier : 20 ISTD Amount :

Sample Info : Project#: 95-1063 Client#: 75MP-45 Water

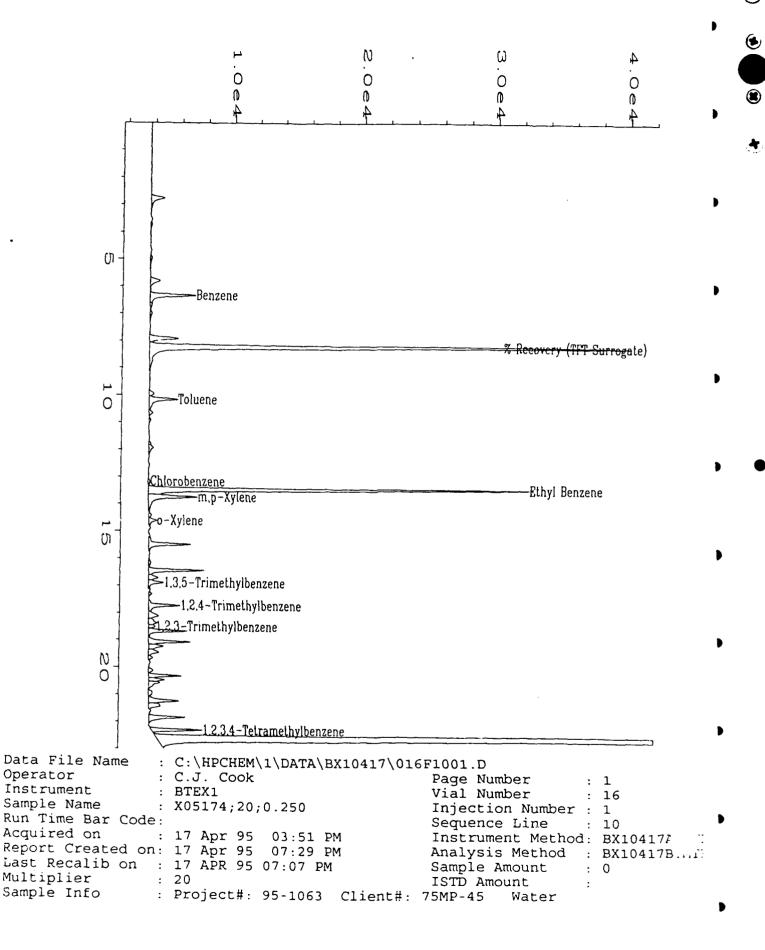
Sig. 1 in C:\HPCHEM\1\DATA\BX10417\016F1001.D

Ret Time	Area	Туре	Width	Ref#	ug/L	Name
6.330	24882	VV	0.107	1		Benzene
8.213	252850	vv	0.106	1-R	1644.939	% Recovery (TFT Surrogate) \$2%
10.151	16893	VV	0.114	1	39.647	Toluene
13.169	1325	VV	0.151	1	3.616	Chlorobenzene
13.456	165067	VV	0.088	1	459.579	_Ethyl Benzene
13.738	29452	VV	0.115	1	66.467	m,p-Xylene
14.606	4565	VV	0.114	1	11.847	o-Xylene
16.889	7670	VV	0.102	1	17.154	1,3,5-Trimethylbenzene
17.726	15398	VV	0.096	1	47.038	1,2,4-Trimethylbenzene
₹8.503	2959	VV	0.087	1	9.089	1,2,3-Trimethylbenzene
22.302	19127	PV	0.079	1	78.479	1,2,3,4-Tetramethylbenzene

Time Reference Peak Expected RT Actual RT Difference 2 8.275 8.213 -0.062

Holding Time

not used

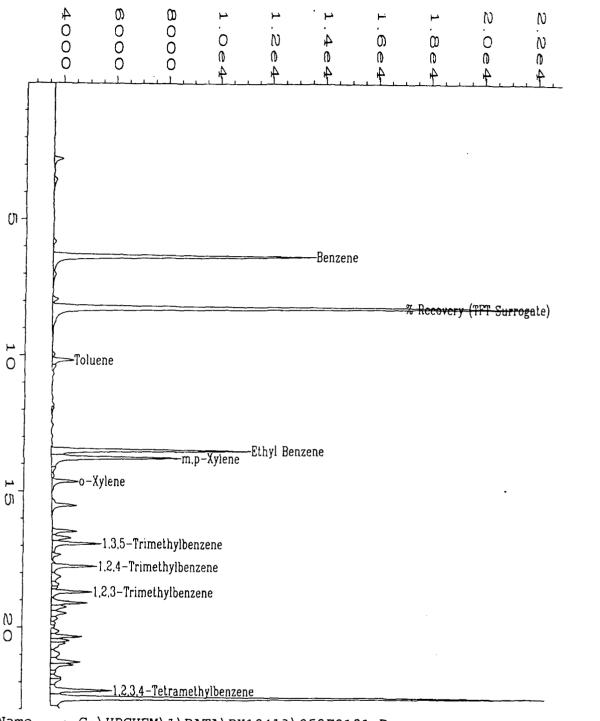


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External Standard Report Data File Name : C:\HPCHEM\1\DATA\BX10413\\$59F0101.D erator : C.J. Cook Page Number : BTEX1 Vial Number ...strument Sample Name : X05172;10;500ul Injection Number: 1 Sequence Line : 1 Run Time Bar Code: Acquired on : 15 Apr 95 01:57 AM Instrument Method: BX10414.MTH Report Created on: 27 Apr 95 07:38 PM Analysis Method : BX10414B.MTH Last Recalib on : 15 APR 95 01:55 PM Sample Amount : 0.5 10 ISTD Amount Multiplier Sample Info : Project#: 95-1063 Client#: MD75-MW8 Water Sig. 1 in C:\HPCHEM\1\DATA\BX10413\059F0101.D Area Type Width Ref# ug/L Name Ret Time |----|---|----|----|----|----| ₹.299 Benzene ×20 67582 VV 0.103 1 6.342 4d.116 % Recovery (TFT Surrogate) 80% 8.231 0.105 1-R 124091 VV 0.105 1 0.675 Toluene 10.170 5850 VV 13.189 * not found * Chlorobenzene 1 5\791 Ethyl Benzene x 20 43118 VV 0.086 1 13.484 32604 VV 0.099 1 3 539 m,p-Xylene 13.764 0.\906 o-Xylene 7187 VV 0.106 1 14.632 1.211 1,3,5-Trimethylbenzene 1.481 1,2,4-Trimethylbenzene 12049 VV 0.096 1 16.917 17.754 10787 VV 0.094 1 9541 VV 0.093 1 1.426 1,2,3-Trimethylbenzene 18.694 2.847 1,2,3,4-Tetramethylbenzene 22.309 15804 HH 0.101 1 Time Reference Peak Expected RT Actual RT Difference 8.231 0.003 8.228 Part Milling Not all calibrated peaks were found



Data File Name : C:\HPCHEM\1\DATA\BX10413\059F0101.D Operator : C.J. Cook Page Number : 1 Instrument : BTEX1 Vial Number : 59 Sample Name : X05172;10;500ul Injection Number: 1 Run Time Bar Code: Sequence Line : 1 Acquired on : 15 Apr 95 01:57 AM Instrument Method: BX10414 Report Created on: 27 Apr 95 07:38 PM Analysis Method : BX10414B.MT Last Recalib on : 15 APR 95 01:55 PM Sample Amount : : 0.5 Multiplier ISTD Amount Sample Info : Project#: 95-1063 Client#: MD75-MW8 Water

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External Standard Report Data File Name : C:\HPCHEM\1\DATA\BX10417\015F1001.D erator ___Page Number : C.J. Cook)_nstrument : BTEX1 Vial Number Injection Number: 1 Sample Name : X05173;20;0.250 Run Time Bar Code: Sequence Line : 10 Instrument Method: BX10417A.MTH Acquired on : 17 Apr 95 03:12 PM Report Created on: 17 Apr 95 07:28 PM Analysis Method : BX10417B.MTH Last Recalib on : 17 APR 95 07:07 PM Sample Amount : 0 Multiplier : 20 ISTD Amount Sample Info : Project#: 95-1063 Client#: MD75-MW14 Water

Sig. 1	in	C:\HPCHEM\	1\	DATA\BX10417\	015F1001.D
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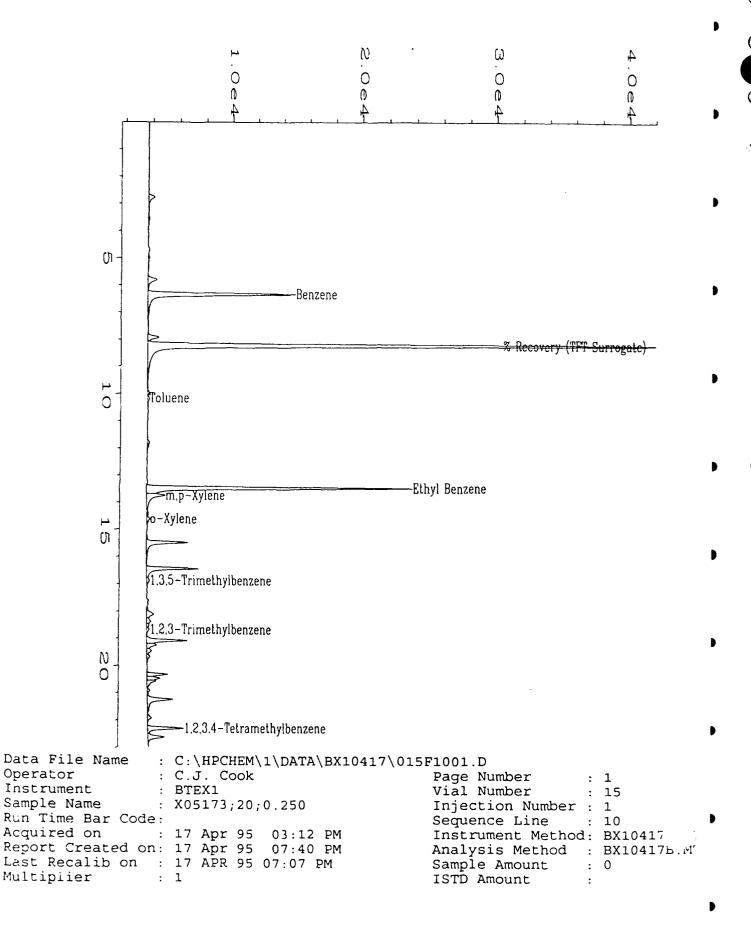
Ret Time	Area	Type	Width	Rei#	ug/L	Name
6.329	80094	VV	0.108	1	173.451	Benzene X T
8.214	279353	$\nabla \nabla$	0.107	1-R	1817.356	% Recovery (TFT Surrogate) 9/10
10.158	2133	VV	0.192	1	5.006	Toluene
13.196	* not found	*		1		Chlorobenzene
13.453	118673	VV	0.090	1	330.408	_Ethyl Benzene
13.732	14373	VV	0.144	1	32.436	m,p-Xylene 🖔
14.603	2380	VV	0.141	1	6.176	o-Xylene
16.876	2003	VV	0.149	1	4.479	1,3,5-Trimethylbenzene
17.775	* not found	*		1		1,2,4-Trimethylbenzene
$\P_{8.670}$	1658	VV	0.120	1	5.092	1,2,3-Trimethylbenzene
22.293	15313	PV	0.089	1	62.829	1,2,3,4-Tetramethylbenzene

Difference Time Reference Peak Expected RT Actual RT 8.275 8.214 -0.061 2

Not all calibrated peaks were found

Holding Time

no fee





CASE NARRATIVE

Evergreen Analytical Laboratory (EAL) Project #: 95-1044

Parsons Engineering Science, Inc. (PES) Project: MacDill AFB (722450.21020)

Sample Receipt

On March 31, 1995, 26 water samples, one field blank and two trip blanks were received in good condition at EAL with the following discrepancies: the alkalinity bottle for MD75-MW5 was labeled MW4; all bottles for MD75-2 were labeled MD75-MW2 except the bottle for anions which was labeled MW1; alkalinity and TOC bottles were missing for 75MP-8D; there were extra TOC bottles for 75MP-8S and 75MP-9D; TOC bottles were missing for 75MP-8S MSD, and 75MP-9S; alkalinity bottles were missing for 75MP-9D, 75MP-9S and MD75-MW13; anion bottles were received but not listed on the chain of custody for 75MP-9D, 75MP-9S and MD75-MW13.

These discrepancies were handled as follows per instructions from John Hicks and Mark Vessely of PES: the alkalinity bottle MD75-MW4 was relabeled MW5; the sample IDs for MD75-2 were corrected to read MD75-MW2; alkalinity and TOC samples were not taken for 75MP-8D; the TOC bottle labeled for 75MP-9D was relabeled 75MP-9S; bottles for alkalinity 75MP-9D, 75MP-9S and MD75-MW13 were reassigned for anions.

There were several sets of MS/MSD samples submitted to cover those missing from previous sample shipments. The aliquots had already been taken for those samples, therefore, only one set of MS/MSD samples per method were used on this project.

Refer to the EAL Sample Log Sheet for specific log-in information and cross-reference of EAL and PES sample identifications.

BTEX, Water Matrix, Method 602

All samples were analyzed within holding times except MD75-MW9 which was re-run outside holding times to confirm low surrogate recovery, (64% vs 70%). The sample was also analyzed at a 10x dilution 4 days out of holding time for 1,2,3,4-tetramethylbenzene. The original results are reported.

The Method Blank MB041295 exhibited toluene and total xylene contamination at less than 1 ppb.

There were no other quality control anomalies to report.

Page Two Case Narrative Parsons Engineering Science 95-1044

Total Volatile Hydrocarbons (TVH), Water Matrix, Method 8015M There were no quality control anomalies to report.

General Chemistry
Samples submitted for MS/MSD analyses for alkalinity and TOC are not appropriate to the method.

There were no quality control anomalies to report.

Patricia A. McClellan, Project Manager

Custodian/Date:\

Page 1 of 1 Page(s)

Lab ID #	Client ID#	Analysis	Mtx	Btl	Loc	
X05071A/B	75MP-8D	* BTEX	W	40V	2	_
X05072A/B	75MP-8S	* BTEX	W	40V	2	_
X05073A/B	75MP-28S	* BTEX	W	40V	2	
X05074A/B	75MP-8S (MS)	* BTEX	W	40V	2	
X05075A/B	75MP-8S (MSD)	* BTEX	W	40V	2	
X05076A	RINSEATE BLANK	* BTEX	W	40V	2	
X05077A	FIELD BLANK	* BTEX	W	40V	22	
X05078A/B	75MP-9D	* BTEX	w	40V	2	
X05079A/B	75MP-9S	* BTEX	w	40V	22	_
X05080A/B	MD75-MW13	* BTEX	W	40V	2	
X05081A/B	MD75-MW11	* BTEX	W	40V	2	
X05082A/B	MD75-MW10	* BTEX	W	40V	2	
X05083A/B	MD75-MW9	* BTEX	w	40V	2	_
X05084A/B	TRIP BLANK	* BTEX	W	40V	2	
X05056C/D	56 MP-2S	TVPH	W	4 0 V	2	_
X05057C/D	56 MP-7S	TVPH	W	4 0 V	2	
X05058C/D	MATRIX SPIKE	HOLD	W	40V	2	
X05059C/D	MATRIX SPIKE DUP	HOLD	W	40V	2	
X05060C/D	MD56-MW4	TVPH	W	40V	2	
X05061C/D	MATRIX SPIKE	HOLD	W	40V	2	_
X05062C/D	MATRIX SPIKE DUP	HOLD	W	40V	2	
X05063C/D	MD75-MW5	TVPH	W	40V	2	
X05064C/D	MATRIX SPIKE	HOLD	W	40V	2	_
X05065C/D	MATRIX SPIKE DUP	HOLD	W	40V	2	_
X05066C/D	MD75-MW1	TVPH	W	40V	2	
X05067C/D	75MP-5D	TVPH	W	40V	2	
X05068C/D	75MP-6D	TVPH	W	40V	2	_
X05069C/D	MD75-MW2	TVPH	W	40V	2	_
X05071C	75MP-8D	TVPH	W	40V	2	_
X05072C/D	75MP-8S	TVPH	W	40V	2	_
X05073C/D	75MP-28S	TVPH	W	40V	2	
X05074C/D	75MP-8S (MS)	ТУРН	W	40V	2	_
X05075C	75MP-8S (MSD)	TVPH	W	40V	2	_
X05078C/D	75MP-9D	TVPH	W	40V	2	_
X05079C	75MP-9S	TVPH	W	40V	2	_
X05080C/D	MD75-MW13	TVPH	W	<u> </u>		-

Page 2 of 4 Pages

Project # 95- 1044

R=Sample to be returned

Lab ID #	Client ID#	Analysis_ ·	Mt	x Btl Loc
● `5081C/D	MD75-MW11	TVPH	W	40V 2
[™] <u>∧∪5082C/D</u>	MD75-MW10	TVPH	W	40V 2
X05083C/D	MD75-MW9	TVPH	W	40V 2
X05056	56 MP-2S	ANIONS C1, NO, , NO, , SO, -2	W	125P C2
X05057	56 MP-7S	ANIONS Cl, NO, NO, SO, 2	W	125P C2
X05058	MATRIX SPIKE	HOLD	W	125P 2
X05059	MATRIX SPIKE	DUP HOLD	W	125P 2
X05060	MD56-MW4	ANIONS Cl, NO, NO, SO, 2	W	125P C2
X05061	MATRIX SPIKE	HOLD	W	125P 2
X05062	MATRIX SPIKE	DUP HOLD	W	125P 2
X05063	MD75-MW5	ANIONS C1, NO, , NO, , SO, -2	W	125P C2
X05064	MATRIX SPIKE	HOLD	W	125P 2
X05065	MATRIX SPIKE	DUP HOLD	W	125P 2
X05066	MD75-MW1	ANIONS Cl, NO, NO, SO, 2	W	125P C2
X05067	75MP-5D	ANIONS Cl, NO, NO, SO, 2	W	125P C2
X05068	75MP-6D	ANIONS Cl, NO, NO, SO, 2	W	125P C2
X05069	★ MD75-MW2	ANIONS Cl , NO ₂ , NO ₄ , SO ₄ -2	W	125P C2
5072	75MP-8S	ANIONS C1, NO, , NO, , SO, -2	W	125P C2
X05073	75MP-28S	ANIONS Cl ⁻ , NO ₂ ⁻ , NO ₄ ⁻ , SO ₄ ⁻²	W	125P C2
X05074	75MP-8S (MS)	ANIONS Cl ⁻ , NO ₂ ⁻ , NO ₄ ⁻ , SO ₄ ⁻²	W	125P C2
X05075	75MP-8S (MSD)	ANIONS C1, NO, , NO, , SO, -2	W	125P C2
X05081	MD75-MW11	ANIONS C1, NO, , NO, , SO, -2	<u> </u>	125P C2
X05082	MD75-MW10	ANIONS C1, NO, , NO, , SO, -2	W	125P C2
X05083	MD75-MW9	ANIONS C1, NO, , NO, , SO, -2	W	125P C2
X05071	75MP-8D	ANIONS C1, NO, , NO, , SO, -2	W	125P C2
X05078	75MP-9D	ANIONS C1, NO, , NO, , SO, 2	W	250P C2
X05079	75MP-9S	ANIONS Cl , NO ₂ , NO ₄ , SO ₄ - 2	W	250P C2
X05080	MD75-MW13	ANIONS C1, NO, , NO, , SO, -2	W	250P C2
X05057	56 MP-7S	ALKALINITY	W	250P C2
X05060	MD56-MW4	ALKALINITY	W	250P C2
X05063	★ MD75-MW5	ALKALINITY	W	250P C2
X05072	75MP-8S	ALKALINITY	W	250P C2
X05073	75MP-28S	ALKALINITY	W	250P C2
Y0 <u>5074</u>	75MP-8S (MS)	HOLD	W	250P C2

Page 3 of 4 Pages
R=Sample to be returned

Project # 95-1044

Lab ID#	Client ID#	Analysis	<u>M</u> tx	Btl Loc
X05075	75MP-8S (MSD)	HOLD	W	250P C2
X05081	MD75-MW11	ALKALINITY	W	250P C2
X05057	56 MP-7S	TOC	W	250A C2
<u> </u>	MD56-MW4	TOC	W	250A C2
X05063	MD75-MW5	TOC	W	250A C2
X05075	75MP-85 (MSD)	TOC	W	250A C2
X05072	75MP-85	TOC	W	250A C2
X05073	75MP-28S	TOC	W	250A C2
X05074	75MP-8S (MS)	TOC	W	250A C2
X05079	75MP-9S	TOC	W	250A C2

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- Page / of 2 Widemainer 2 YWD 21020 expedited turnaround subject to additional fee P.O.# 30 CLIENT CONTACT (print) 7244 02455T TURNAROUND REQUIRED. PROJECT I.D. EAL. QUOTE #

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ANALYSIS REQUESTED

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Date/Time Received by: (Signature) Relinquished by: (Signature)

Date/Time | Relinquished by: (Signature)

te loxiner Date/Time | Peceived by: (Signature)

13319



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PROJECT SPECIAL INSTRUCTIONS 94-

Date: 3 3 EAL Contact: fatty client contact: John Hicks Parsons ES
INSTRUCTIONS: Screen discupancies will be handled as follows:
X05071 75MP-8D try to analyze alkalinity from anions-wait on The X05072 75MP-85 hold TOC 75MP-85 W05074 & X05075 are the msamso for X05072. TOC is missing for spike dup-can we use the matrix spike bottle for lo
X05089X05078 & X05079 = analyze anions and alkalinity from anion bothles (marked alkalinity on COC).
X05078-Hold Toc bottle - No TOC Reguested on COC
105069-mis 10'd on coc. Should be m075-mwz
1 X05063 - alkalinity mislabled. Should read MD75-mw5
X05058, X05059, X05061, X05062, X05064 and X05065 are cancelled.

(**3**)

T-ROM & MARK VESSELY PARSONS E.S.

WITH REGARD TO THE COC MIX WP:

- Alalinity potret muy should be labeled MDS
- @ Bottles should need MD75-MW2; THE Simple name was wrong Dr. the COC.
 Again, MWI should be MW2 a misluboled
- 3) Alkalinity barries and Tac barries were not taken at 75 MP-BD. I accordently to checked the Alkalinity and Tac. Boxes
- be for 75 MP-852 MSD, I mislabeled the bottle.
- 5) THE Toc. BOTTLE FOR 75 MP-90 Should be for 75 MP-95. Again, I mislabeled the Sample
- As For the missing Alkalinity BOTTLES; 75MP-75MP-95, 1 MO75-MWB T checked the Wrong box on the COC. They were intended for Anim Lests
 - Sorry about the mix up I hope. this fux will straighten things out .

MAKE. VESSELY & Parsons E.S.

Evergreen Analytical Sample Receipt/Check-in Record
Date & Time Rec'd: 3/3/195 900 Shipped Via: Fed Ex 958/8069 (Airbill # if applicable)
Client: HOSONS try,
Client Project ID(s): 722450,21020
EAL Project #(s):95- 104 EAL Cooler(s): Y N
Cooler# 218
Ice packs (Y) N Y N Y N Y N
Temperature & COO
1. Custody seal(s) present: Seals on cooler intact Seals on bottle intact
2. Chain of Custody present:
3. Containers broken or leaking: (Comment on COC if Y)
4. Containers labeled:
5. COC agrees w/ bottles received: (Comment on COC if N)
6. COC agrees w/ labels: (Comment on COC if N)
7. Headspace in VOA vials-waters only (comment on COC if Y)
8. VOA samples preserved:
9. pH measured on metals, cyanide or phenolics*:
10. Metal samples present:
Total, Dissolved D or PD to be filtered:
T,TR,D,PD to be Preserved:
11. Short holding times: Specify parameters
12. Mult:-phase sample(s) present:
13. COC signed w/ date/time:
Comments:
(Additional comments on back)
(Additional comments on back) Custodian Signature/Date: 11 ('onnor 3/3/95)

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(4)

ADDHESS (700 BASADWAI, SULTO 900 CITY DUNCK STATE CO ZIP BOX90 FAX* PHONE # 707-8160

Jungfield St.
N Ridge, Colorado 80033 (25-6021)
N 3 425-6854

Evergreen Analytical Inc.

CLIENT CONTACT (print) Lend 1 TURNAROUND REQUIRED" 30 0 475 PROJECT 1.D 72 L 450, 2 1030 *expedited turnaround subject to additional fee EAL. QUOTE #_

FAX RESULTS Y / N

W Hidg (303) 425-6 (303) 425-6 (800) 845-7

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EAL use only Do not write	in shaded area EAL Project # Custodian EAL Sample No.											Location	Container Size
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ANALYSIS REQUESTED	Circle & list metals below) Dissolved Metals - DW / SW846 O'CICLE & list metals below) O'CICLE & list metals below)		X			X	1	12	$\langle X \rangle$				
H H	Total Metals-DW / WPDES / SW846 (Circle & list metals below) Dissolved Metals-	\dashv						100	2			: ::::::::::::::::::::::::::::::::::::	38
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	Pesticides 8080/608 (circle)												
	VOA 8250/624/524.2 (circle) BNA 8270/625 (circle)											. 3245	inte Sett
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VESSELY	No	2	3	W	<u> </u>	3	3	\vdash	3/.	13/	3/2		
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MARK	rgreen Analytical Cool ler Received Please Ball info CLIENT SAMPLE IDENTIFICATION	56 MP-25	56 mp-75	MATRIX SPIKE	50,	MD56-MW 4	Metrix Spike		mws	rateix Spike	io. ke		
2	Evergreen Analytical Cooler Received	np-	np.		*.	1	×	raters Sorke	1-	^7	Ĭ,		
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elinquished by: (Signature)	un hour	\wedge

Date/Time | Received by: (Signature) | State/Time

Date/Time Relinquished by: (Signature)



Evergreen Analytical Inc. 4036 Younglield St.

Sur7 & 900 21P 80290 Engineer ng Bean way STATE_CO. PHONE# 303 831-8100 COMPANY Cor Son 5 CITY Der SEC ADDRESS / 700

⋘

Wheat Ridge, Colorado 80033 (303) 425-6021 FAX (303) 425-6854 (800) 845-7400

Windeman 02012.02422C DAZS *expedited turnaround subject to additional fee P.O.* 36 CLIENT CONTACT (print) Todd TURNAROUND REQUIRED. EAL. QUOTE #__ PROJECT I.D.

Do not write in shaded area EAL use only

ANALYSIS REQUESTED

Z

FAX RESULTS Y /

Page 2 of 2

MATRIX O/Discharge/Ground FAX# VESSELY 200 Evergreen Analytical Cooler No._ me MARK Sampler Name: Cooler Received (signature) (print)_

Please PRINT

in shaded area		EAL Decision #	Custodian	EAL Sample No.											Location	Container Size	
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	Evergreen Analytical Cooler No. Color Cooler Received	Please PRINT	all information:	CLIENT SÁMPLE IDENTIFICATION	1 mu-3+0W	75 MP-50	15MP-60	C-Stow	Trip Blank						HT.	DD:	Instructions: 600

50 C Instructions:

Relinquished by. (Signature)

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Date/Time | Pr. Date/Time Received by: (Signature)

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FRE Connor Date/Time | Received by: (Signature)

SISI GI



Evergreen Analytical Sample Receipt/Check-in Record
Date & Time Rec'd: 33195 900 shipped Via: Fed Ex 9581826
Client: Parsons (Airbill # if applicable)
Client Project ID(s): 722450,2120
EAL Project #(s):95- 1044 EAL Cooler(s): (Y) N
Cooler# (Cld
Ice packs (Y) N Y N Y N Y N Y N
Temperature °C (D)C
1. Custody seal(s) present: Seals on cooler intact Seals on bottle intact
2. Chain of Custody present:
3. Containers broken or leaking: (Comment on COC if Y)
4. Containers labeled:
5. COC agrees w/ bottles received: (Comment on COC if N)
6. COC agrees w/ labels: (Comment on COC if N)
7. Headspace in VOA vials-waters only (comment on COC if Y)
8. VOA samples preserved:
9. pH measured on metals, cyanide or phenolics*: List discrepancies *Non-EAL provided containers only, water samples only.
10. Metal samples present:
Total , Dissolved
D or PD to be filtered:
11. Short holding times: Specify parameters
12. Multi-phase sample(s) present:
13. COC signed w/ date/time:
Comments:
(Additional comments on back) Custodian Signature/Date: £11 CMh & 3/3/195

(b)

Evergreen. Selaner 5417 400 ZIP 80290 FAX # COMPANY Ly ... 11 & Engineering ADDRESS 1700 Bronding PHONE# 303-831-8100 CITY DEMME STATE CO

(signature) Lth Sampler Name:

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4038 rounglield St. Wheat Ridge, Colorado 80033 (303) 425-6021 FAX (303) 425-6854 (800) 845-7400 z FAX RESULTS Y /

lytical Inc.

CLIENT CONTACT (pint) Todd Wirdemayer 722450, 21020 PROJECT I.D. EAL. QUOTE #

2010

SYMP expedited turnaround subject to additional fee TURNAROUND REQUIRED. 30

EAL use only Do not write	in shaded area EAL Project # Custodian EAL Sample No				,							Location	Container Size	
ANALYSIS REQUESTED 2	BNA 8270/625 (circle) Pesticides 8080/608 (circle) Pesticides 8150/515 (circle) Herbicides 8150/515 (circle)	× × ×	X X X	X	XXX	×	×	×	×	×××	× ×			
MATRIX	Soil / Sludge TCLP VOA/BNA/Pest/Hear #1											-		Ice
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لا الله	ANT Containers DATE SAMPLED TIME	3/30/95/10:9-5	3/30/95 1115 7	3/30/95/11:15 7	3/30/15/11/15/7	3/30/65 11:15 7	(3/30/b5 11/15 1	3/30/85/11.15/	732/95 12:40 5	3/30/15 12:56	3/30/95 1/320 5			les purhed 1
(pint) MARK V	Evergreen Analytical Cooler No. 60 Cooler Received Please PRINT all information: CLIENT SAMPLE IDENTIFICATION SAMPLE	75mp-80	75 mp-85	15m0-185	MATRIX Spike	Markix Spike Dup	Rinscale BlANK	Field Blank	75MP-9D	75 MP-95	MD75-MW13	HT.	oo:	Instructions: 5mg !

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4036 Younglield St. Wheat Ridge, Colorado 80033 (303) 425-6021 FAX (303) 425-6854 (800) 845-7400 Evergreen Analytical Inc. ADDRESS 1700 BRONDWING SAILS 900 CONPANY PUSSONS ENGINEERING SCIENCE ZIP A0290 FAX # STATE CO PHONE# 303-831-8/00 (signature) CITY- Chancer Sampler Name: ijď,

Page Zot Z	CLIENT CONTACT (pint) Told Wied a mare	PROJECTIO 722 450, 21020	EAL. QUOTE #	TURNAROUND REQUIRED: 30 4 AV S	*expedited turnaround subject to additional fee

FAX RESULTS Y / N

	EAL use only	Do not write	in shaded area			-	/ EAL	Project #	Custodian	Tip Doison		EAL Sample No.					
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Instructions:

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Date/Time 2)21186

Container Size

Location







EAL Sample No. Do not write in shaded area Wiedemaia EAL use only Page / of · Container Size Location day 2102 *expedited turnaround subject to additional fee P.O.# :\$ ø. 122450. CLIENT CONTACT (print) Tod! TURNAROUND REQUIRED. EAL. QUOTE # PROJECT 1.D. ANALYSIS REQUESTED $_{\circlearrowleft}$ ×A× 7 × 大文文 0) Total Metals-DW/ NPDES / SW8;
(circle & list metals below)

Dissolved Metals - DW / SW846
(circle & list metals below) TEPH 8015mod. (Diesel) Wheat Ridge, Colorado 80033 TVPH 8015mod. (Gasoline) Analytical Inc. (abito) 1.514 essent & NOVI.314 H4AT FAX RESULTS Y / × ٠, ٠٧. > (303) 425-6021 FAX (303) 425-6854 (800) 845-7400 GTEX 3020/602 (circle)/MTBE (circle) * +036 Youngfield St. × PCS Screen Herbicides 8150/515 (circle) PesyPCBs 8080/608/508 (circle) • Pesticides 8080/608, (circle) Evergr BNA 8270/625 (circle) VOA 8260/624/524.2 (Circle) SIBIBM\dieHV289q\ANB\AOV MATRIX 3 bilos / lios × Water-Drinlung/Discharge/Ground 5417+ 8029 No. of Containers 1 ۴ 17.00 1320 TIME Ep gimering 3/30/55 130/85 130/55 3/30/18 3/30/95 5 7 3/30/65 SAMPLED -8100 3/30/35 · VESSELY DATE 3/30 STATE CO 3/30/ Please PRIN all information: Brown Evergreen Analytical Cooler No. 3.3-83 Markiv Soike Dup BIAnk Mw 13 MATRIX Spike 8 lank DENTIFICATION 200 1 MARK mp-28 isignature), Land Ç SAMPLE CLIENT 28-9m JSMP-80 Sampler Name: 9-Kinscafe Cooler Received Instructions: 75 30 SAP COMPANY 604 ADDRESS PHONE Iprint) CITY 5 ä

Date/Time Received by: (Signature) Re inquished by: (Signature)

Data/Time (Relinquished by: (Signature)

Date/Time | Received by: (Signature)

Date/Time

3661 11

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Page / of 2

Evergreen Analytical Inc.

5411 900 ZIP 80290 COMPANY PUSONS Engineering Ben dulay 1) was STATE 60

1.50

ADDRESS_

FAX

3,3-831-8100

PHONE

CITY

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4036 Younglield St. Wheat Pudge, Colorado 80033 (303) 425-6021 FAX (303) 425-6854 (800) 845-7400 FAX RESULTS Y / N

Wiedemajac day 2102 30 CLIENT CONTACT (print) Todd OSHEEL TURNAROUND REQUIRED* EAL. QUOTE # PROJECT 1.D.

'expedited rumaround subject to additional fee

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EAL Sample No.

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Çustodian

in shaded area

EAL-use only Do not write

ANALYSIS REQUESTED

MATRIX

MARK . VESSELY

(print)

(signature) 122

Sampler Name:

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95-1044

Memo to Patty McClellan, Evergreen Analytical 3/31/95

Subject: Your fax of earlier today

Here's a list of the discrepencies between the samples and the COC, and the resolution that we agreed on over the phone. Since then, I have talked to the field people, and their clarifications/comments are also described below (in bold). They will send you a marked-up copy of the COCs showing the corrections (via fax I think).

Alkalinity bottle labeled MW4--will assume is MW5. Field people say that should have been MW5.

Bottles labeled MW2 except anion labeled MW1--will assume all are MW2. Field people say that MW2 is correct.

Alkalinity and TOC bottles missing for 75MP-8D--will take alkalinity sample from anions bottle, and will hold on TOC for our instructions. TOC will not be collected from this well.

Extra TOC for 75MP-8S and 9D, and missing TOC for 75MP8S MSD and 9S--hold per our instructions. TOC for 75MP-8S should be 75MP-8S MSD, and 9D should be 9S.

Alkalinity (should be anions, not alkalinity) bottles missing for 75MP-9D, 9S, and MD75-MW13 (bottles say anions but COC says alkalinity). Will run both analyses on the samples. They checked the alkalinity box by mistake. Should be run for anions and not alkalinity.

Anions received but not on COC for 75MP-9D, 9S, and MD75-MW13--will run the anions definitely, and also do alkalinity if have enough sample.

Alkalinity not scoped, so just run anions.

I said to expect about 11 samples not including QC on Saturday. This is about right. Will also receive 8 TEH samples tomorrow.

Patty will check whether the TOC is being filtered. Did you find out? If so, please call me today.

John Hicks

Post-it Fax Note 7671 Date 3/3//95 pages /

To Patty McChillan From Jah. Holes

Colompi Everynen Co Poulous Es

Phone # Prone # F31-8 (CV)

Fax # 725-6854 Fax # -82 us

Method 602 Data Report

Client Sample Number	: MD75-MW1	Client Project No.	: 722450.21020/MacD
Lab Sample Number	: X05066	Lab Project No.	: 95-1044
Date Sampled	: 3/29/95	Dilution Factor	: 1.00
Date Received	: 3/31/95	Method	: 602
Date Prepared	: 4/12/95	Matrix	: Water
Date Analyzed	: 4/12/95	Lab File No.	: BX1041219
		Method Blank No.	: MB041295

		Sample	
Compound Name	Cas Number	Concentration	RL
_		ug/L	ug/L
Benzene	71-43-2	U	0.4
Toluene	108-88-3	υ	0.4
Chlorobenzene	108-90-7	υ	0.4
Ethyl Benzene	100-41-4	U	0.4
Total Xylenes	108-38-3, 106-42-3	U	0.4
(m, p & o)	and 95-47-6		
1,3,5-Trimethylbenzene	108-67-8	U	0.4
1,2,4-Trimethylbenzene	95-63-6	υ	0.4
1,2,3-Trimethylbenzene	526-73-8	U	0.4
1,2,3,4-Tetramethylbenzene	488-23-3	U	0.4
Surrogate Recovery $(\alpha,\alpha,\alpha$ -Trifluo	rotoluene):	82%	70%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

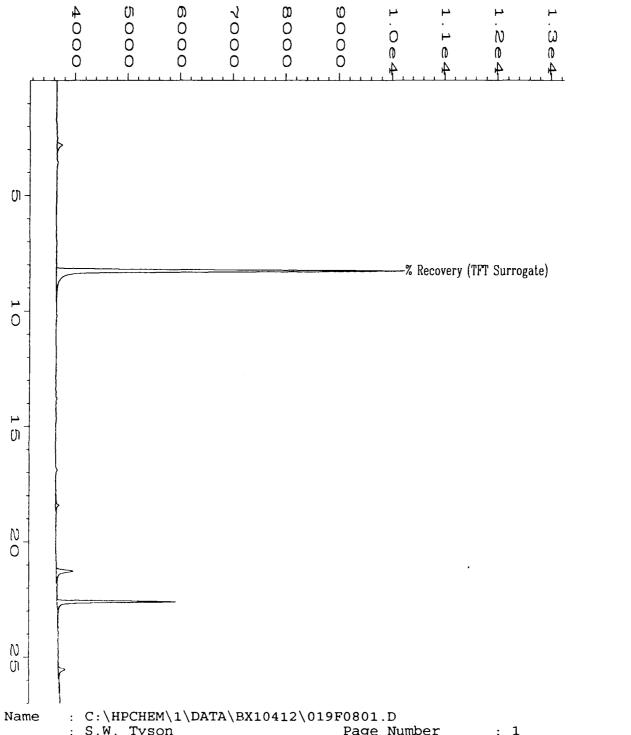
U = Compound analyzed for, but not detected.

B = Compound also found in the blank.

J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

RL = Reporting Limit.

NA = Not Available/Not Applicable.



Data File Name Operator : S.W. Tyson Page Number Instrument : BTEX1 : X05067;1;5 Vial Number : 19 Sample Name Injection Number : 1 Pun Time Bar Code: Sequence Line : 8 quired on : 12 Apr 95 01:08 PM Instrument Method: BX10408.MTH port Created on: 28 Apr 95 07:39 PM Analysis Method : BX10412B.MTH Last Recalib on : 28 APR 95 07:11 PM Sample Amount Multiplier ISTD Amount mym 5/1/95 Sample Info : Project # 95-1044 Client # 75MP-5D Water MD75 - MWI

Method 602 Data Report

Client Sample Number : MD75-MW2 Client Project No. : 722450.21020/MacE Lab Project No. : 95-1044 Lab Sample Number : X05069 **Date Sampled** : 3/29/95 **Dilution Factor** : 1.00 : 602 Method **Date Received** : 3/31/95 Matrix : Water **Date Prepared** : 4/12/95 **Date Analyzed** : 4/12/95 Lab File No. : BX1041223 Method Blank No. : MB041295

Compound Name	Cas Number	San Concent ug/L		RL ug/L
Benzene	71-43-2		U	0.4
Toluene	108-88-3	0.6	В.	0.4
Chlorobenzene	108-90-7		U	0.4
Ethyl Benzene	100-41-4		U	0.4
Total Xylenes	108-38-3, 106-42-3		U	0.4
(m, p & o) 1,3,5-Trimethylbenzene	and 95-47-6 108-67-8		U	0.4
1,2,4-Trimethylbenzene	95-63-6		U	0.4
1,2,3-Trimethylbenzene	526-73-8		υ	0.4
1,2,3,4-Tetramethylbenzene	488-23-3		υ	0.4
Surrogate Recovery (α,α,α-Trifluo	rotoluene):	80%		70%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

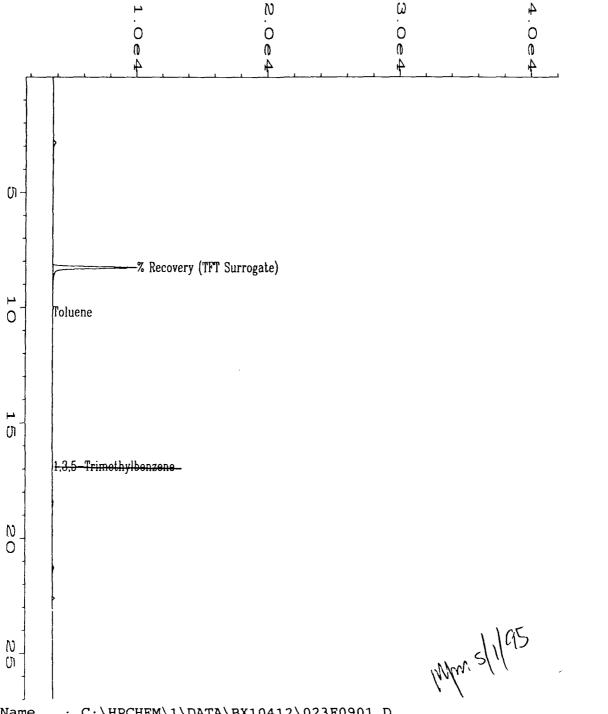
U = Compound analyzed for, but not detected,

B = Compound also found in the blank.

J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

RL = Reporting Limit.

NA = Not Available/Not Applicable.



```
Data File Name
                  : C:\HPCHEM\1\DATA\BX10412\023F0901.D
Operator
                  : S.W. Tyson
                                                    Page Number
                                                    Vial Number
Instrument
                  : BTEX1
                                                                      : 23
Sample Name
                  : X05069;1;5
                                                    Injection Number :
                                                                        1
Run Time Bar Code:
                                                                      : 9
                                                    Sequence Line
 Tuired on : 12 Apr 95 03:42 PM
port Created on: 28 Apr 95 07:41 PM
                                                    Instrument Method: BX10412.MTH
                                                    Analysis Method : BX10412B.MTH
Last Recalib on : 28 APR 95 07:11 PM
                                                    Sample Amount
                                                                      : 0
Multiplier
                  : 1
                                                    ISTD Amount
Sample Info
                  : Project # 95-1044 Client # MD75-MW2 Water
```

Method 602 Data Report

Client Sample Number	: MD56-MW4	Client Project No.	: 722450.21020/MacD
Lab Sample Number	: X05060	Lab Project No.	: 95-1044
Date Sampled	: 3/29/95	Dilution Factor	: 1.00
Date Received	: 3/31/95	Method	: 602
Date Prepared	: 4/12/95	Matrix	: Water
Date Analyzed	: 4/12/95	Lab File No.	: BX1041214
		Method Blank No.	: MB041295

		San	nple		
Compound Name	Cas Number	Concentration		RL	
		ug/L		ug/L	
Benzene	71-43-2		U	0.4	
Toluene	108-88-3	0.6	В	0.4	
Chlorobenzene	108-90-7		U	0.4	
Ethyl Benzene	100-41-4		U	0.4	
Total Xylenes	108-38-3, 106-42-3		U	0.4	
(m, p & o)	and 95-47-6				
1,3,5-Trimethylbenzene	108-67-8		U	0.4	
1,2,4-Trimethylbenzene	95-63-6		U	0.4	
1,2,3-Trimethylbenzene	526-73-8		U	0.4	
1,2,3,4-Tetramethylbenzene	488-23-3		U	0.4	

91%

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

Surrogate Recovery (\alpha, \alpha, \alpha - Trifluorotoluene):

B = Compound also found in the blank.

J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

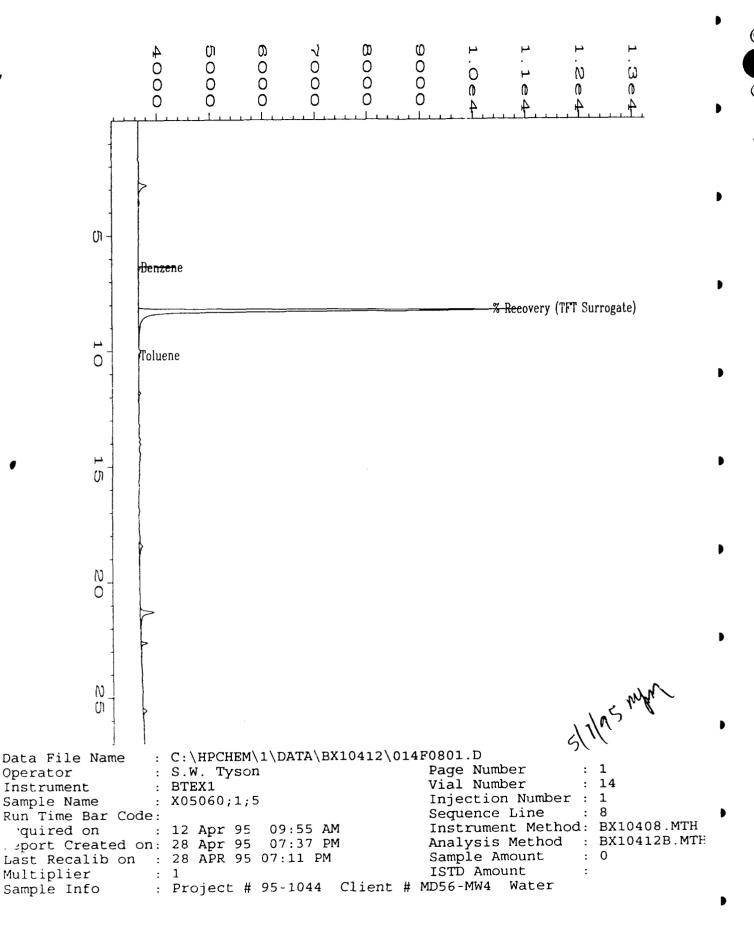
RL = Reporting Limit.

NA = Not Available/Not Applicable.

Analyst

Approved

70%-130% (QC limits)



Method 602 Data Report

Client Sample Number	: MD75-MW5	Client Project No.	: 722450.21020/MacE
Lab Sample Number	: X05C63	Lab Project No.	: 95-1044
Date Sampled	: 3/29/95	Dilution Factor	: 1.00
Date Received	: 3/31/95	Method	: 602
Date Prepared	: 4/12/95	Matrix	: Water
Date Analyzed	: 4/12/95	Lab File No.	: BX1041217
•		Method Blank No.	: MB041295

Compound Name	Cas Number	San Concent ug/L	-	RL ug/L	
Benzene	71-43-2	-	U	0.4	-
Toluene	108-88-3	0.9	В	0.4	
Chlorobenzene	108-90-7		U	0.4	
Ethyl Benzene	100-41-4		U	0.4	
Total Xylenes	108-38-3, 106-42-3		U	0.4	
(m, p & o)	and 95-47-6				
1,3,5-Trimethylbenzene	108-67-8	0.6		0.4	
1,2,4-Trimethylbenzene	95-63-6		U	0.4	
1,2,3-Trimethylbenzene	526-73-8	0.5		0.4	
1,2,3,4-Tetramethylbenzene	488-23-3		U	0.4	
Surrogate Recovery (α,α,α-Trifluo	rotoluene):	84%		70%-130% (QC limit	_ !:

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

B = Compound also found in the blank.

J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

RL = Reporting Limit.

NA = Not Available/Not Applicable.

Analyst



9)

Method 602 Data Report

: 722450.21020/Mac[Client Sample Number : MD75-MW5 Client Project No. : 95-1044 Lab Sample Number : X05063DUP Lab Project No. **Date Sampled** : 3/29/95 **Dilution Factor** : 1.00 Method : 602 : 3/31/95 **Date Received** : Water Matrix **Date Prepared** : 4/12/95 : 4/12/95 Lab File No. : BX1041218 **Date Analyzed** : MB041295 Method Blank No.

Compound Name	Cas Number	San Concent ug/L	ration	RL _ug/L	
Benzene	71-43-2		U	0.4	
Toluene	108-88-3	0.7	В	0.4	
Chlorobenzene	108-90-7		U	0.4	
Ethyl Benzene	100-41-4		· U	0.4	
Total Xylenes	108-38-3, 106-42-3	0.4	В	0.4	
(m, p & o)	and 95-47-6			0.4	
1,3,5-Trimethylbenzene	108-67-8		U	0.4	
1,2,4-Trimethylbenzene	95-63-6		U	0.4	
1,2,3-Trimethylbenzene	526-73-8		U	0.4	
1,2,3,4-Tetramethylbenzene	488-23-3		U	0.4	
Surrogate Recovery (α,α,α-Trifluo	rotoluene):	84%	= * * -	70%-130% (C	C limit:

Note: Total Xylenes consist of three isomers, two of which co-elute.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

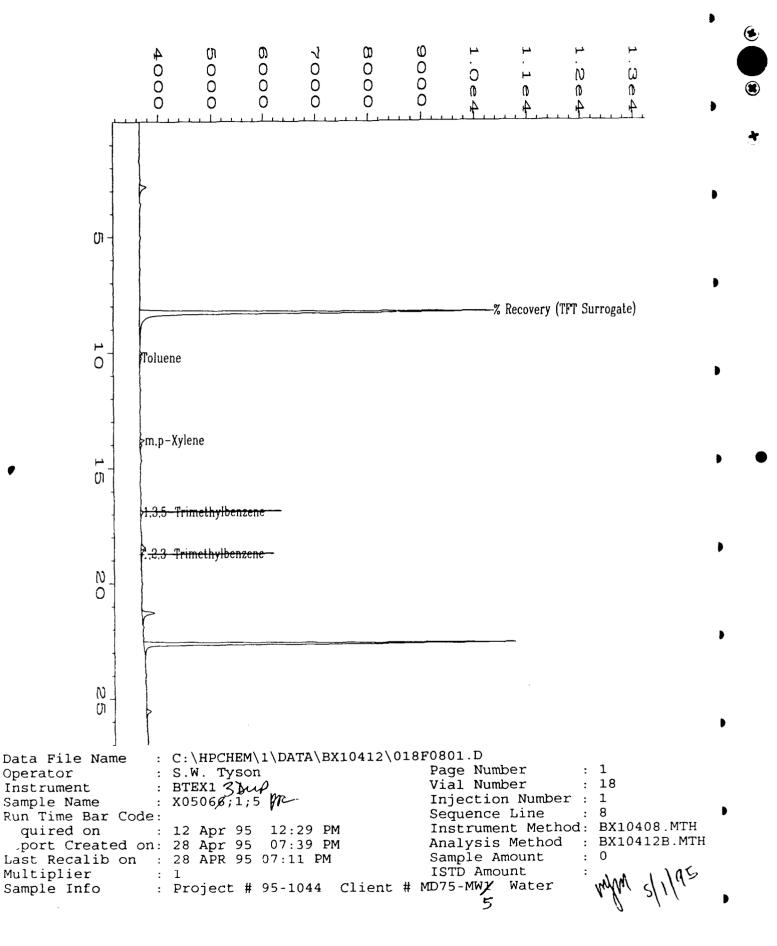
The Xylene RL is for a single peak.

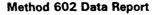
B = Compound also found in the blank.

J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

RL = Reporting Limit.

NA = Not Available/Not Applicable.





Client Sample Number : MD75-MW9 Client Project No. : 722450.21020/MacI Lab Sample Number : X05083 Lab Project No. : 95-1044 : 1.00 **Dilution Factor Date Sampled** : 3/30/95 **Date Received** : 3/31/95 Method : 602 : Water Matrix : 4/13/95 **Date Prepared Date Analyzed** : 4/13/95 Lab File No. : BX2041325 Method Blank No. : MB041395

Compound Name	Cas Number	Sample Concentration ug/L	RL ug/L
Benzene	71-43-2	U	0.4
Toluene	108-88-3	1.0	0.4
Chlorobenzene	108-90-7	0.8	0.4
Ethyl Benzene	100-41-4	57	0.4
Total Xylenes	108-38-3, 106-42-3	1.1	0.4
(m, p & o) 1,3,5-Trimethylbenzene	and 95-47-6 108-67-8	U	0.4
1,2,4-Trimethylbenzene	95-63-6	0.7	0.4
1,2,3-Trimethylbenzene	526-73-8	0.4	0.4
1,2,3,4-Tetramethylbenzene	488-23-3	>80**	0.4
Surregate Recovery (\alpha, \alpha, \alpha - Trifluo	rotoluene):	64% *	70%-130% (QC limits

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

B = Compound also found in the blank.

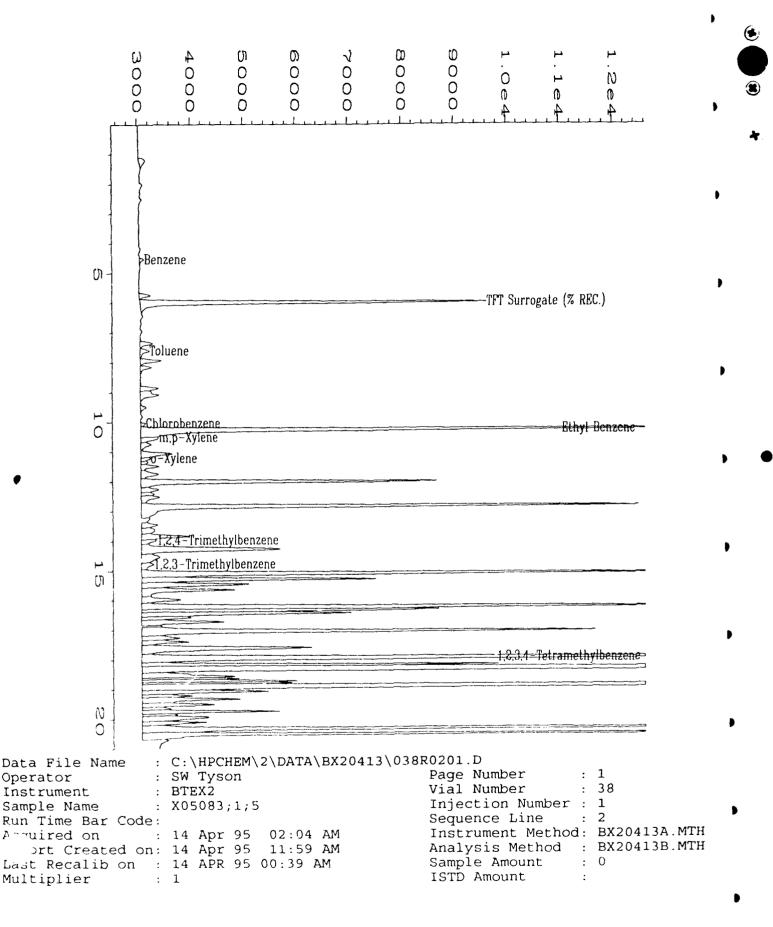
RL = Reporting Limit.

NA = Not Available/Not Applicable.

One____

^{** =} Greater than 10% calibration range. See BX10417020 (DF = 10) run past holding time.

^{* =} Out of limit. See BX1041338 (DF = 1) run past holding time.



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Method 602 Data Report

Client Sample Number	: MD75-MW10	Client Project No.	: 722450.21020/MacC
Lab Sample Number	: X05082	Lab Project No.	: 95-1044
Date Sampled	: 3/30/95	Dilution Factor	: 1.00
Date Received	: 3/31/95	Method	: 602
Date Prepared	: 4/13/95	Matrix	: Water
Date Analyzed	: 4/13/95	Lab File No.	: BX2041327
		Method Blank No.	: MB041395

		Sample				
Compound Name	Cas Number	Concentration	RL			
		ug/L	ug/L			
Benzene	71-43-2	7.2	0.4	_		
Toluene	108-88-3	υ	0.4			
Chlorobenzene	108-90-7	υ	0.4	,		
Ethyl Benzene	100-41-4	65	0.4			
Total Xylenes	108-38-3, 106-42-3	1.6	0.4			
(m, p & o)	and 95-47-6					
1,3,5-Trimethylbenzene	108-67-8	1.5	0.4			
1,2,4-Trimethylbenzene	95-63-6	υ	0.4			
1,2,3-Trimethylbenzene	526-73-8	U	0.4			
1,2,3,4-Tetramethylbenzene	488-23-3	28	0.4			
Surrogate Recovery (α,α,α-Trifluo	protoluene):	71%	70%-130% (QC lim	its		

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected,

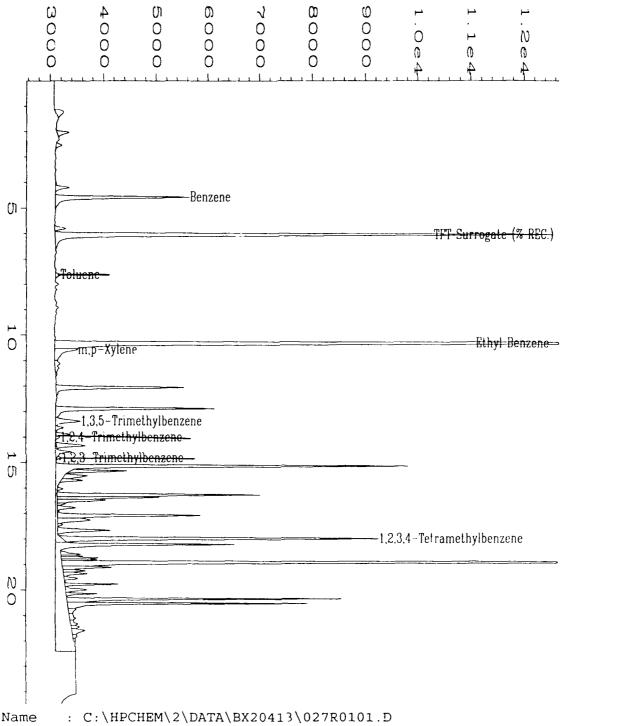
B = Compound also found in the blank.

J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

RL = Reporting Limit.

NA = Not Available/Not Applicable.

Analyst



Data File Name Operator : SW Tyson Page Number Vial Number Instrument : 27 : BTEX2 Sample Name : X05082;1;5 Injection Number: 1 Run Time Bar Code: Sequence Line : 1 quired on Instrument Method: BX20413.MTH : 13 Apr 95 05:47 PM sport Created on: 13 Apr 95 06:12 PM Analysis Method : BX20413.MTH Last Recalib on : 13 APR 95 02:16 AM Sample Amount Multiplier : 1 ISTD Amount Sample Info : Project # 95-1044 Client # MD75-MW10 Water

Method 602 Data Report

Client Sample Number	: MD75-MW11	Client Project No.	: 722450.21020/MacE
Lab Sample Number	: X05081	Lab Project No.	: 95-1044
Date Sampled	: 3/30/95	Dilution Factor	: 1.00
Date Received	: 3/31/95	Method	: 602
Date Prepared	: 4/13/95	Matrix	: Water
Date Analyzed	: 4/13/95	Lab File No.	: BX2041323
·		Method Blank No.	: MB041395

	Sample				
Compound Name	Cas Number	Concentration	RL		
•		ug/L	ug/L		
Benzene	71-43-2	U	0.4		
Toluene	108-88-3	U	0.4		
Chlorobenzene	108-90-7	U	0.4		
Ethyl Benzene	100-41-4	υ	0.4		
Total Xylenes	108-38-3, 106-42-3	0.9	0.4		
(m, p & o)	and 95-47-6				
1,3,5-Trimethylbenzene	108-67-8	U	0.4		
1,2,4-Trimethylbenzene	95-63-6	0.5	0.4		
1,2,3-Trimethylbenzene	526-73-8	U	0.4		
1,2,3,4-Tetramethylbenzene	488-23-3	U	0.4		
Surrogate Recovery (\alpha, \alpha, \alpha - Trifluo	rotoluene):	78%	70%-130% (QC limits		

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

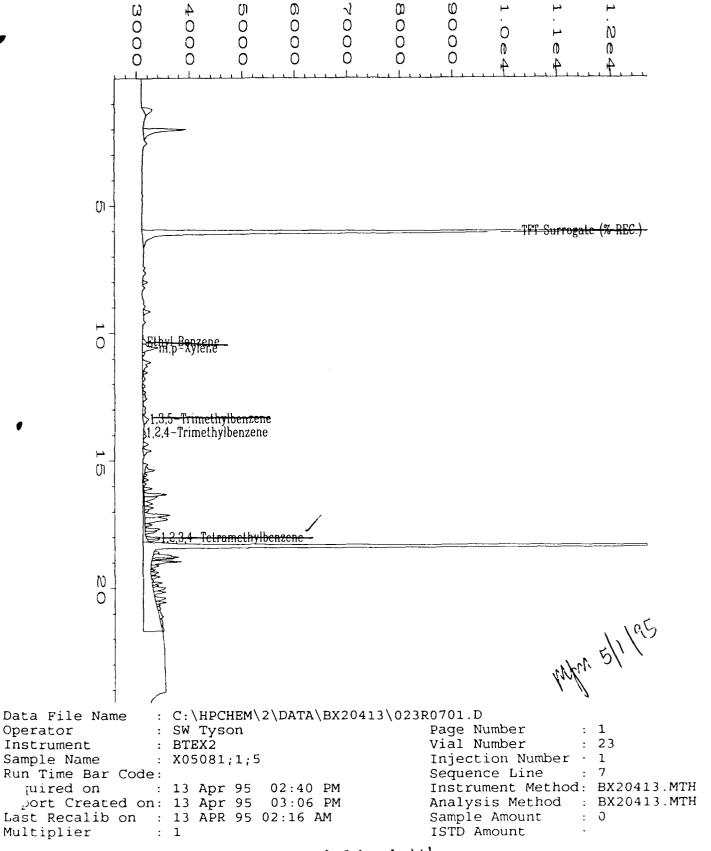
U = Compound analyzed for, but not detected.

B = Compound also found in the blank.

J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

RL = Reporting Limit.

NA = Not Available/Not Applicable.



MD75-MWII

Operator

Method 602 Data Report

Client Sample Number	: MD75-MW13	Client Project No.	: 722450.21020/MacE
Lab Sample Number	: X05080	Lab Project No.	: 95-1044
Date Sampled	: 3/30/95	Dilution Factor	: 1.00
Date Received	: 3/31/95	Method	: 602
Date Prepared	: 4/13/95	Matrix	: Water
Date Analyzed	: 4/13/95	Lab File No.	: BX2041321
		Method Blank No.	: MB041395

Compound Name	Cas Number	Sample Concentration ug/L	RL ug/L
Benzene	71-43-2	1.3	0.4
Toluene	108-88-3	U	0.4
Chlorobenzene	108-90-7	U	0.4
Ethyl Benzene	100-41-4	6.5	0.4
Total Xylenes	108-38-3, 106-42-3	1.2	0.4
(m, p & o) 1,3,5-Trimethylbenzene	and 95-47-6 108-67-8	U	0.4
1,5,5-11titlettiyibelizetle	100-07-0	O	0.4
1,2,4-Trimethylbenzene	95-63-6	2.1	0.4
1,2,3-Trimethylbenzene	526-73-8	U	0.4
1,2,3,4-Tetramethylbenzene	488-23-3	1.1	0.4
Surrogate Recovery (α,α,α-Trifluo	protoiuene):	79%	70%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

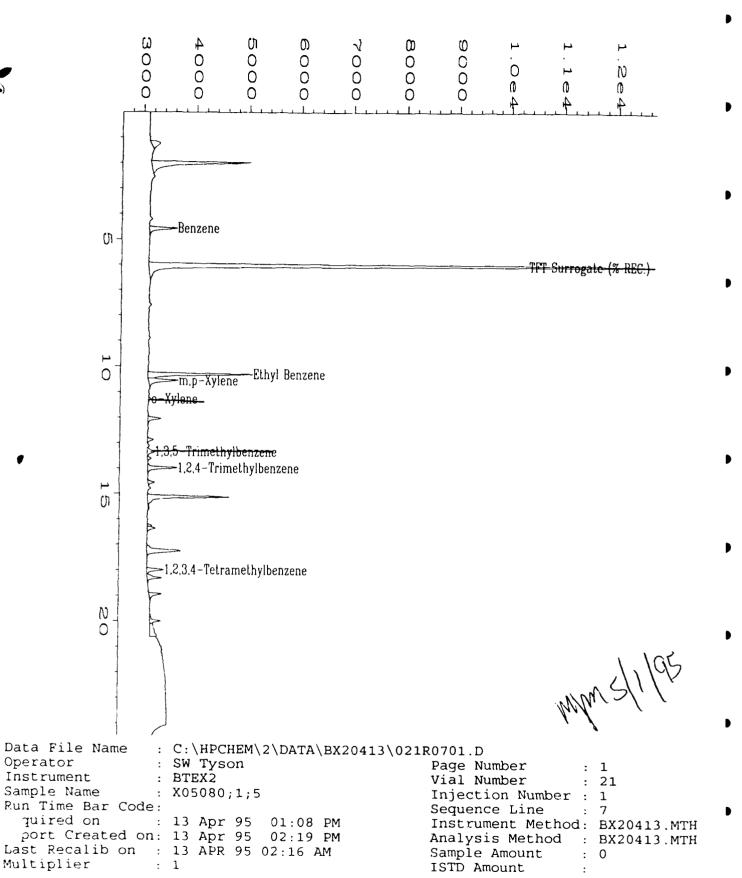
B = Compound also found in the blank.

J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

RL = Reporting Limit.

NA = Not Available/Not Applicable.

Analyst



Method 602 Data Report

Client Project No. : 722450.21020/MacD : MD75-MW13 Client Sample Number Lab Sample Number : X05080DUP Lab Project No. : 95-1044 **Dilution Factor** : 1.00 : 3/30/95 **Date Sampled Date Received** : 3/31/95 Method : 602 Matrix **Date Prepared** : 4/13/95 : Water : 4/13/95 Lab File No. : BX2041322 **Date Analyzed** Method Blank No. : MB041395

	Sample			
Compound Name	Cas Number	Concentration	RL	
		ug/L	ug/L	
Benzene	71-43-2	1.3	0.4	
Toluene	108-88-3	U	0.4	
Chlorobenzene	108-90-7	U	0.4	
Ethyl Benzene	100-41-4	6.6	0.4	
Total Xylenes	108-38-3, 106-42-3	1.5	0.4	
(m, p & o)	and 95-47-6			
1,3,5-Trimethylbenzene	108-67-8	0.5	0.4	
1,2,4-Trimethylbenzene	95-63-6	2.2	0.4	
1,2,3-Trimethylbenzene	526-73-8	υ	0.4	
1,2,3,4-Tetramethylbenzene	488-23-3	1.3	0.4	
Surrogate Recovery (α,α,α-Trifluo	protoluene):	79%	70%-130% (QC	limits

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

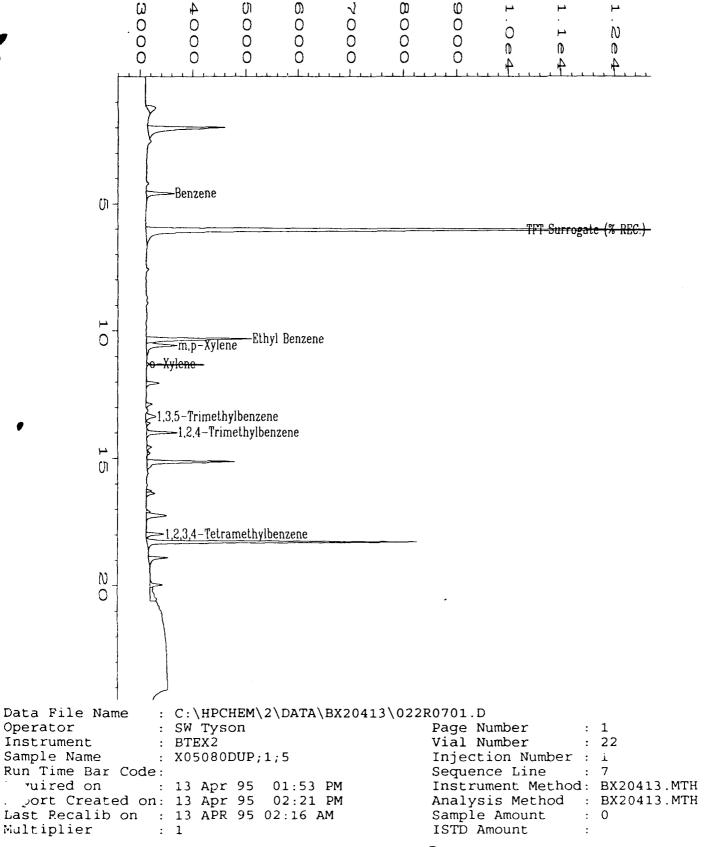
B = Compound also found in the blank.

J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

RL = Reporting Limit.

NA = Not Available/Not Applicable.

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MD75-MW13

Operator

Method 602 Data Report

Client Sample Number	: 75MP-5D	Client Project No.	: 722450.21020/Mac[
Lab Sample Number	: X05067	Lab Project No.	: 95-1044
Date Sampled	: 3/29/95	Dilution Factor	: 1.00
Date Received	: 3/31/95	Method	: 602
Date Prepared	: 4/12/95	Matrix	: Water
Date Analyzed	: 4/12/95	Lab File No.	: BX1041220
<u>-</u>		Method Blank No.	: MB041295

Compound Name	Cas Number	Sample Concentration ug/L		RL ug/L	
Benzene	71-43-2	0.8		0.4	
Toluene	108-88-3	0.9	В	0.4	
Chlorobenzene	108-90-7		U	0.4	
Ethyl Benzene	100-41-4		U	0.4	
Total Xylenes	108-38-3, 106-42-3	0.6	В	0.4	
(m, p & o) 1,3,5-Trimethylbenzene	and 95-47-6 108-67-8		U	0.4	
1,2,4-Trimethylbenzene	95-63-6	0.4		0.4	
1,2,3-Trimethylbenzene	526-73-8		U	0.4	
1,2,3,4-Tetramethylbenzene	488-23-3	8.3		0.4	
Surrogate Recovery (α,α,α-Trifluorotoluene):		83%		70%-130% (QC limits	

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

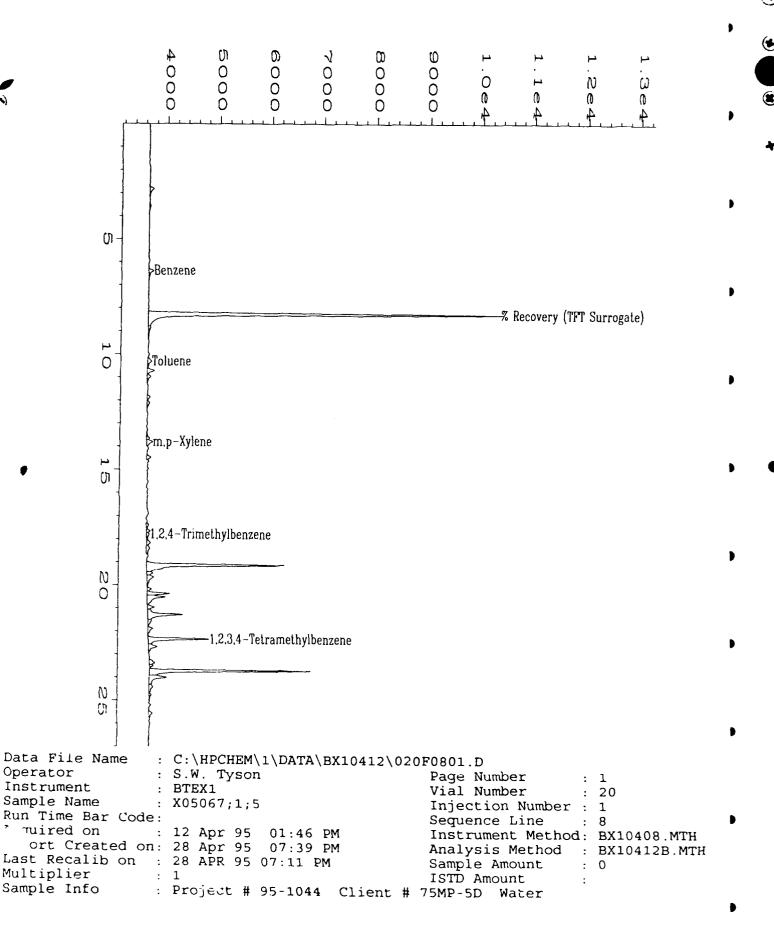
B = Compound also found in the blank.

J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

RL = Reporting Limit.

NA = Not Available/Not Applicable.

Analyst



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Method 602 Data Report

: 722450.21020/MacC : 75MP-6D Client Project No. **Client Sample Number** Lab Sample Number : X05068 Lab Project No. : 95-1044 : 1.00 **Dilution Factor Date Sampled** : 3/29/95 Method : 602 **Date Received** : 3/31/95 : Water **Date Prepared** : 4/12/95 Matrix Lab File No. : BX1041222 **Date Analyzed** : 4/12/95 Method Blank No. : MB041295

Compound Name	Cas Number	Sample Concentration ug/L	RL ug/L	
Benzene	71-43-2	υ	0.4	
Toluene	108-88-3	υ	0.4	
Chlorobenzene	108-90-7	υ	0.4	
Ethyl Benzene	100-41-4	3.2	0.4	
Total Xylenes	108-38-3, 106-42-3	0.5 B	0.4	
(m, p & o) 1,3,5-Trimethylbenzene	and 95-47-6 108-67-8	U	0.4	
1,2,4-Trimethylbenzene	95-63-6	1.5	0.4	
1,2,3-Trimethylbenzene	526-73-8	0.8	0.4	
1,2,3,4-Tetramethylbenzene	488-23-3	17	0.4	
Surrogate Recovery (\alpha, \alpha, \alpha - Trifluo	protoluene):	83%	70%-	130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

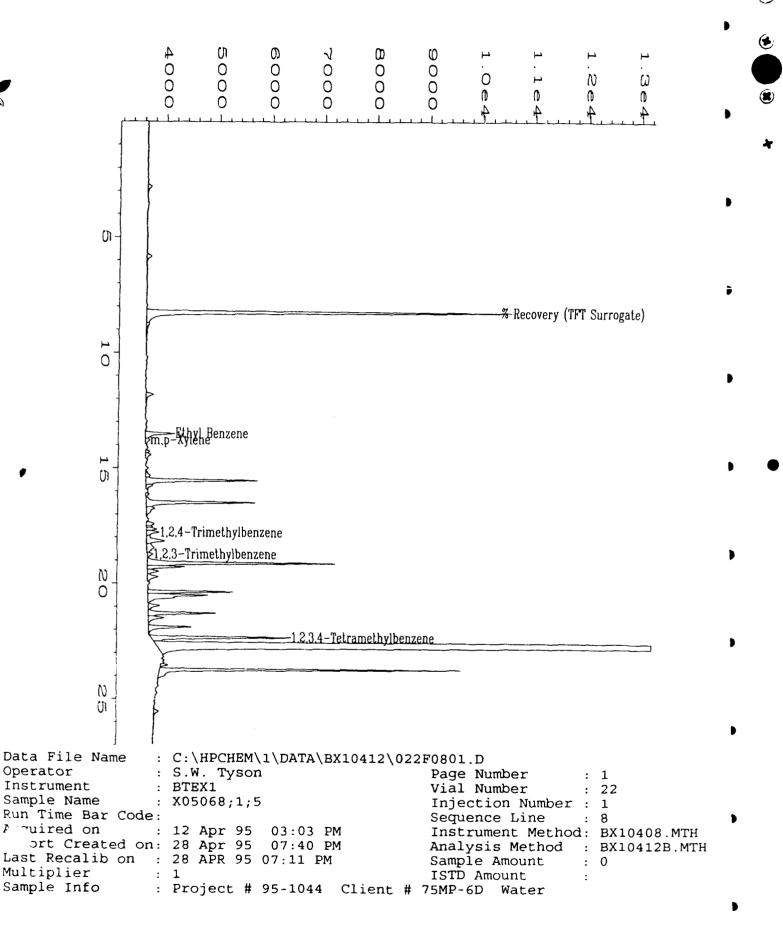
U = Compound analyzed for, but not detected.

B = Compound also found in the blank.

J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

RL = Reporting Limit.

NA = Not Available/Not Applicable.



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Method 602 Data Report

Lab Sample Number : X05072 Lab Product Sampled : 3/30/95 Dilution Date Received : 3/31/95 Method Date Prepared : 4/13/95 Matrix Date Analyzed : 4/13/95 Lab Fi	roject No. : 722450.21020/MacC lect No. : 95-1044 Factor : 1.00 : 602 : Water No. : BX2041311 Blank No. : MB041395
--	---

Compound Name		Sample		
	Cas Number	Concentration	RL	
		ug/L	_ ug/L	1
Benzene	71-43-2	U	0.4	
Toluene	108-88-3	υ	0.4	
Chlorobenzene	108-90-7	U	0.4	1
Ethyl Benzene	100-41-4	U	0.4	
Total Xylenes	108-38-3, 106-42-3	U	0.4	
(m, p & o)	and 95-47-6			
1,3,5-Trimethylbenzene	108-67-8	υ	0.4	l
1,2,4-Trimethylbenzene	95-63-6	U	0.4	
1,2,3-Trimethylbenzene	526-73-8	U	0.4	
1,2,3,4-Tetramethylbenzene	488-23-3	U	0.4	(

Surrogate Recovery (α,α,α -Trifluorotoluene): 95% 70%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

The Xylene RL is for a single peak.

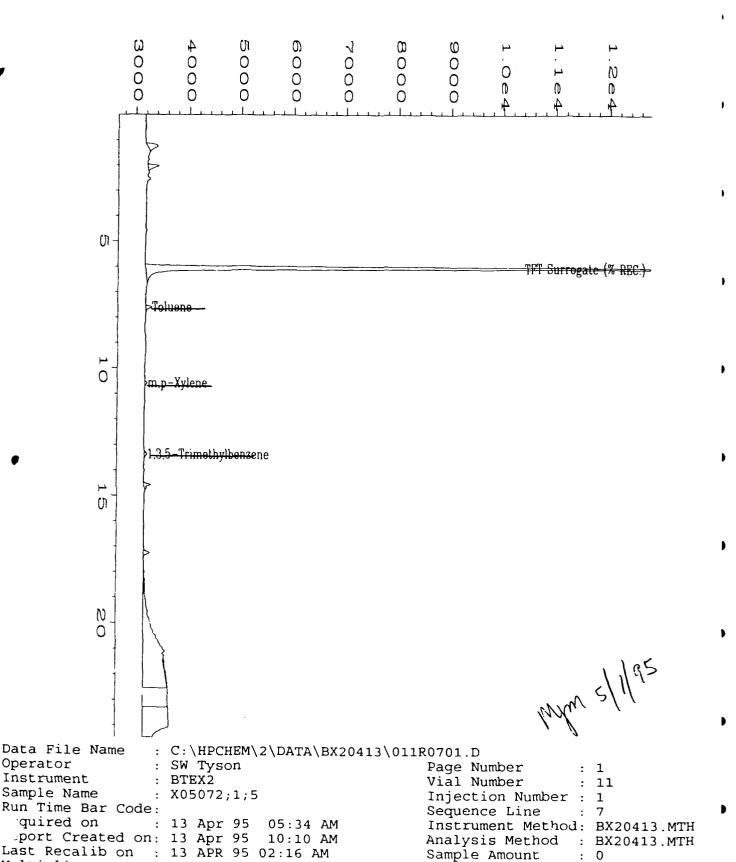
B = Compound also found in the blank.

J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

RL = Reporting Limit.

NA = Not Available/Not Applicable.

Analyst



ISTD Amount

75-MP85

Multiplier

: 1

Method 602 Data Report

Client Sample Number	: 75MP-8D	Client Project No.	: 722450.21020/Macl
Lab Sample Number	: X05071	Lab Project No.	: 95-1044
Date Sampled	: 3/30/95	Dilution Factor	: 1.00
Date Received	: 3/31/95	Method	: 602
Date Prepared	: 4/13/95	Matrix	: Water
Date Analyzed	: 4/13/95	Lab File No.	: BX2041310
		Method Blank No.	: MB041395

Compound Name	Cas Number	Sample Concentration ug/L	RL ug/L	
Benzene	71-43-2	Ū	0.4	_
Toluene	108-88-3	U	0.4	
Chlorobenzene	108-90-7	U	0.4	
Ethyl Benzene	100-41-4	υ	0.4	
Total Xylenes	108-38-3, 106-42-3	U	0.4	
(m, p & o) 1,3,5-Trimethylbenzene	and 95-47-6 108-67-8	U	0.4	
1,2,4-Trimethylbenzene	95-63-6	U	0.4	
1,2,3-Trimethylbenzene	526-73-8	0.9	0.4	
1,2,3,4-Tetramethylbenzene	488-23-3	U	0.4	
Surrogate Recovery (α,α,α-Trifluo	rotoluene):	93%	70%-130% (QC lim	nits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

B = Compound also found in the blank.

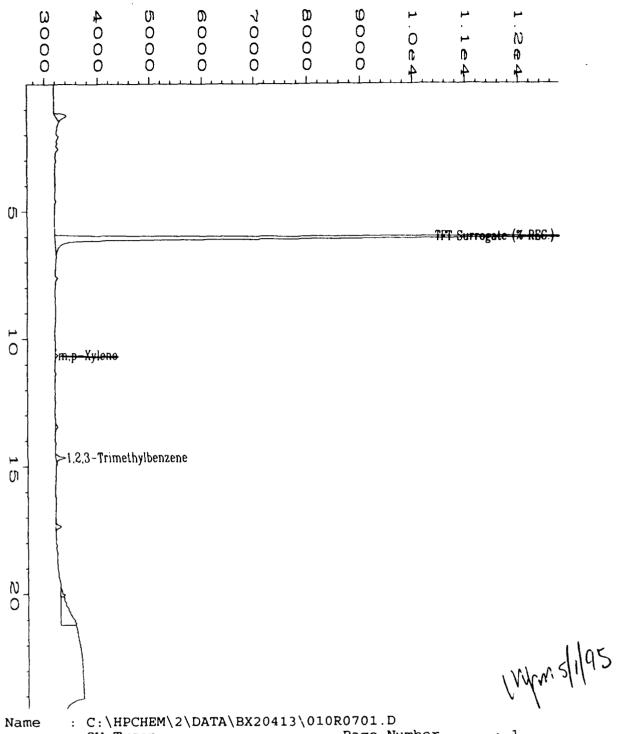
J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

RL = Reporting Limit.

NA = Not Available/Not Applicable.

Analyst

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Data File Name : C:\HPCHEM\2\DATA\BX20413\010R0701.D

Operator : SW Tyson Page Number : 1

Instrument : BTEX2 Vial Number : 10

Sample Name : X05071;1;5 Injectior Number : 1

Run Time Bar Code: Sequence Line : 7

mired on : 13 Apr 95 04:49 AM Instrument Method: BX3

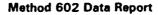
uired on : 13 Apr 95 04:49 AM Instrument Method: BX20413.MTH

port Created on: 13 Apr 95 09:48 AM Analysis Method : BX20413.MTH

Last Recalib on : 13 APR 95 02:16 AM Sample Amount : 0

Last Recalib on : 13 APR 95 02:16 AM Sample Amount : Multiplier : 1 ISTD Amount :

Sample Info : Project # 95-1044 Client # 75MP-8D Water



: 75MP-9S Client Project No. : 722450.21020/MacD **Client Sample Number** : 95-1044 Lab Sample Number : X05079 Lab Project No. **Dilution Factor** : 1.00 **Date Sampled** : 3/30/95 **Date Received** : 3/31/95 Method : 602 Matrix **Date Prepared** : 4/13/95 : Water **Date Analyzed** : 4/13/95 Lab File No. : BX2041320 Method Blank No. : MB041395

		Sample	·	
Compound Name	Cas Number	Concentration	nc	RL
·		ug/L		ug/L
Benzene	71-43-2		Ū	0.4
Toluene	108-88-3	9.1		0.4
Chlorobenzene	108-90-7		U	0.4
Ethyl Benzene	100-41-4		υ	0.4
Total Xylenes	108-38-3, 106-42-3		U	0.4
(m, p & o)	and 95-47-6			
1,3,5-Trimethylbenzene	108-67-8		U	0.4
1,2,4-Trimethylbenzene	95-63-6		U	0.4
1,2,3-Trimethylbenzene	526-73-8		U	0.4
1,2,3,4-Tetramethylbenzene	488-23-3		U	0.4
Surrogate Recovery (α,α,α-Trifluo	protoluene):	85%		70%-130% (QC limits

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

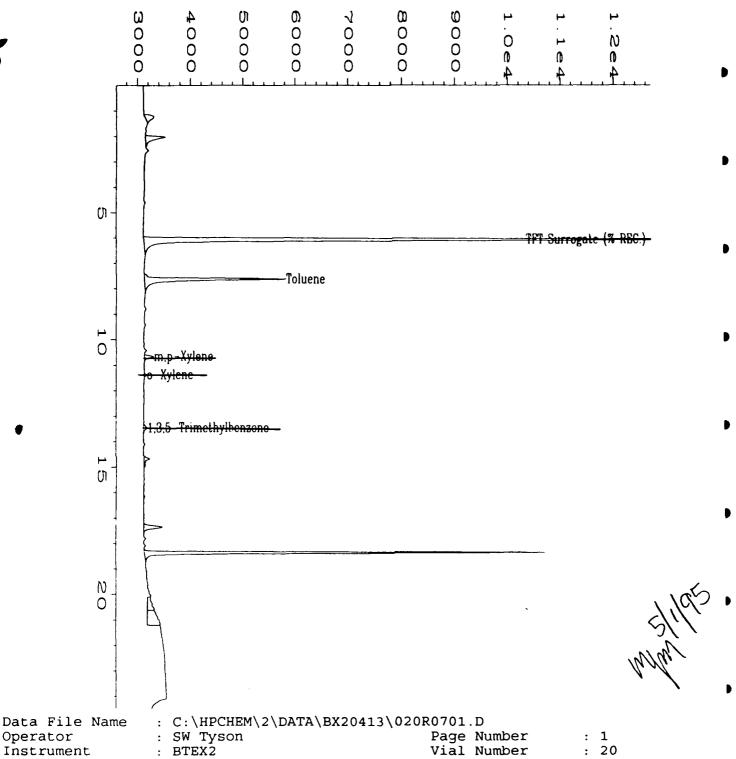
B = Compound also found in the blank.

J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

RL = Reporting Limit.

NA = Not Available/Not Applicable.

Approved



Instrument Sample Name : X05079;1;5 Injection Number: 1 : 7 Run Time Bar Code: Sequence Line Instrument Method: BX20413.MTH : 13 Apr 95 12:22 PM ..port Created on: 13 Apr 95 02:18 PM Analysis Method : BX20413.MTH : 13 APR 95 02:16 AM Sample Amount Last Recalib on ISTD Amount Multiplier

Operator

75MP-95



: 722450.21020/MacE Client Sample Number : 75MP-9D Client Project No. Lab Sample Number : X05078 Lab Project No. : 95-1044 **Date Sampled** : 3/30/95 **Dilution Factor** : 1.00 : 602 **Date Received** : 3/31/95 Method Matrix : Water **Date Prepared** : 4/13/95 Lab File No. : BX2041319 : 4/13/95 **Date Analyzed** Method Blank No. : MB041395

Compound Name	Cas Number	Sample Concentration ug/L	RL ug/L	
Benzene	71-43-2	U	0.4	
Toluene	108-88-3	U	0.4	
Chlorobenzene	108-90-7	U	0.4	
Ethyl Benzene	100-41-4	U	0.4	
Total Xylenes	108-38-3, 106-42-3	U	0.4	
(m, p & o) 1,3,5-Trimethylbenzene	and 95-47-6 108-67-8	U	0.4	
1,2,4-Trimethylbenzene	95-63-6	U	0.4	
1,2,3-Trimethylbenzene	526-73-8	U	0.4	
1,2,3,4-Tetramethylbenzene	488-23-3	U	0.4	

Surrogate Recovery $(\alpha,\alpha,\alpha$ -Trifluorotoluene):

81%

70%-130% (QC limits

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

B = Compound also found in the blank.

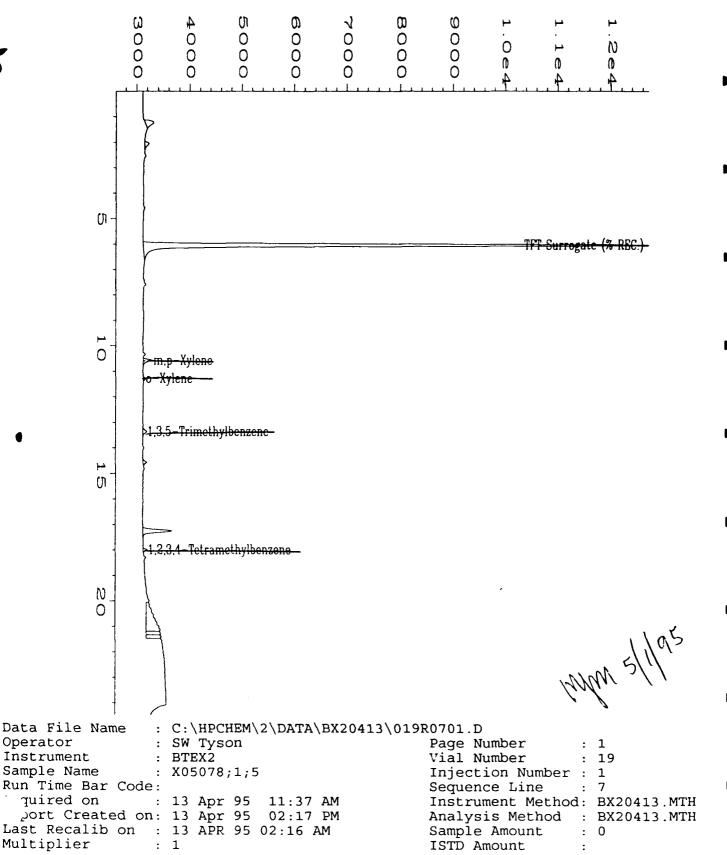
J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

RL = Reporting Limit.

NA = Not Available/Not Applicable.

Analyet

Approved



75MP-9D

Method 602 Data Report

Client Project No. : 722450.21020/Mac[**Client Sample Number** : 75MP-28S : X05073 Lab Project No. : 95-1044 Lab Sample Number : 1.00 **Dilution Factor Date Sampled** : 3/30/95 Method : 602 **Date Received** : 3/31/95 Matrix : Water **Date Prepared** : 4/13/95 Lab File No. : BX2041314 : 4/13/95 **Date Analyzed** Method Blank No. : MB041395

Compound Name	Cas Number	Sample Concentration ug/L	RL ug/L	
Benzene	71-43-2	U	0.4	
Toluene	108-88-3	υ	0.4	
Chlorobenzene	108-90-7	U	0.4	
Ethyl Benzene	100-41-4	υ	0.4	
Total Xylenes	108-38-3, 106-42-3	U	0.4	
(m, p & o) 1,3,5-Trimethylbenzene	and 95-47-6 108-67-8	U	0.4	
1,2,4-Trimethylbenzene	95-63-6	U	0.4	
1,2,3-Trimethylbenzene	526-73-8	υ	0.4	
1,2,3,4-Tetramethylbenzene	488-23-3	U	0.4	
Surrogate Recovery (α,α,α-Trifluo	rotoluene):	90%	70%-130% (QC lii	mits

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

B = Compound also found in the blank.

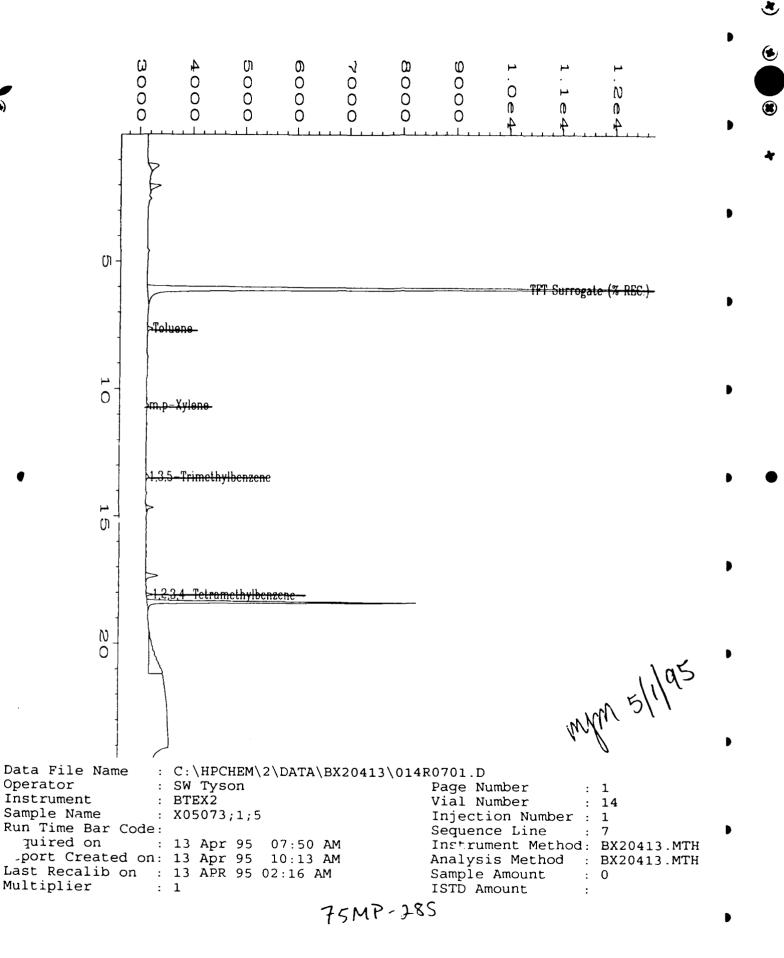
J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

RL = Reporting Limit.

NA = Not Available/Not Applicable.

Approved

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Client Sample No. : 75MP-8S Client Project No. : 722450.21020/MacDill

 Lab Sample No.
 : X05072
 Lab Project No.
 : 95-1044

 Date Sampled
 : 3/30/95
 EPA Method No.
 : 602

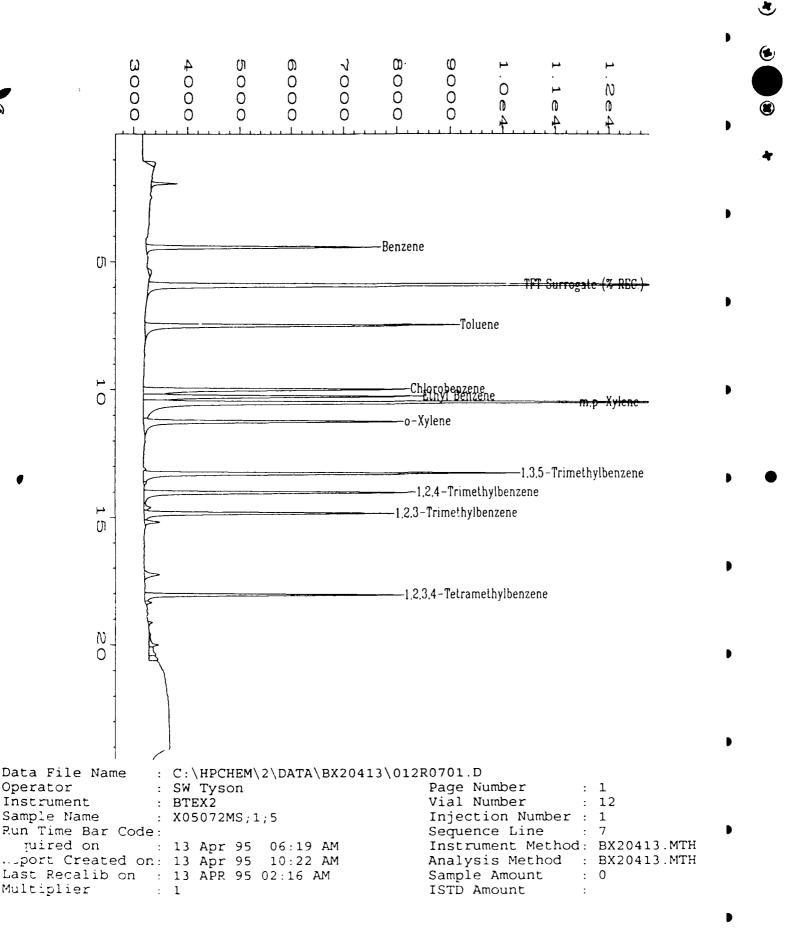
 Date Received
 : 3/31/95
 Matrix
 : Water

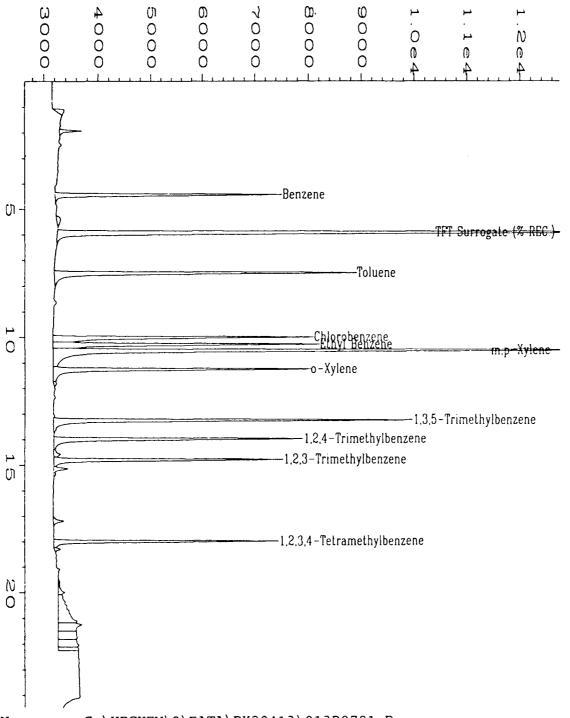
Date Prepared : 4/13/95 Lab File Number(s) : BX1041312,13
Date Analyzed : 4/13/95 Method Blank : MB041395

	Spike	Sample	MS		σc
Compound	Added	Concentration	Concentration	MS	Limits
	(ug/L)	(ug/L)	(ug/L)	%REC	%REC
Benzene	20.0	0.0	11.0	55	50-150
Toluene	20.0	0.0	19.1	96	50-148
Ethyl Benzene	20.0	0.0	18.3	92	50-150
m,p-Xylene	40.0	0.0	37.4	94	50-150
o-Xylene	20.0	0.0	18.4	92	50-150
Chlorobenzene	20.0	0.0	18.0	90	55-135
1,3,5-TMB	20.0	0.0	18.4	92	50-150
1,2,4-TMB	20.0	0.0	18.3	92	50-150
1,2,3-TMB	20.0	0.0	18.7	94	50-1F
1,2,3,4-TeMB	20.0	0.0	19.4	97	50-15u

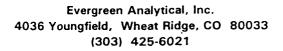
Compound	Spike Added	MSD Concentration	MSD	RPD	1	DC mits
	(ug/L)	(ug/L)	%REC		RPD	%REC
Benzene	20.0	10.4	52	5.6	25	50-150
Toluene	20.0	18.0	90	5.9	25	50-148
Ethyl Benzene	20.0	17.4	87	5.0	25	50-150
m,p-Xylene	40.0	35.1	88	6.3	25	50-150
o-Xylene	20.0	17.5	88	5.0	25	50-150
Chlorobenzene	20.0	17.0	85	5.7	25	55-135
1,3,5-TMB	20.0	17.3	87	6.2	25	50-150
1,2,4-TMB	20.0	16.8	84	8.5	25	50-150
1,2,3-TMB	20.0	17.2	86	8.4	25	50-150
1,2,3,4-TeMB	20.0	16.6	83	15.6	25	50-150

* = Values outside	of QC limi	ts.	
RPD:	0	out of (10) outside limits.	
Spike Recovery:	0	out of (20) outside limits.	,
Comments: Analyst	me		Approved MS10448.XLS





: C:\HPCHEM\2\DATA\BX20413\013R0701.D Data File Name : SW Tyson Page Number Operator Vial Number : BTEX2 : 13 Instrument Injection Number : 1 Sample Name : X05072MSD;1;5 Run Time Bar Code: Sequence Line Instrument Method: BX20413 Acquired on : 13 Apr 95 07:04 AM Analysis Method : BX20413 Report Created on: 13 Apr 95 10:22 AM Last Recalib on : 13 APR 95 02:16 AM Sample Amount ISTD Amount Multiplier : 1



TOTAL VOLATILE HYDROCARBONS TVH Matrix Spike/Matrix Spike Duplicate Data Report

Client Sample No.

: 56MP-2S

Client Project No.

: 722450.21020\MAC

Lab Sample No.

: X05056

Lab Project No. EPA Method No. : 95-1044 : 5030/8015 Mod.

Date Sampled

: 3/29/95

Matrix

: Water

Date Received Date Prepared : 3/31/95 : 4/11/95

Method Blank

: MB041295

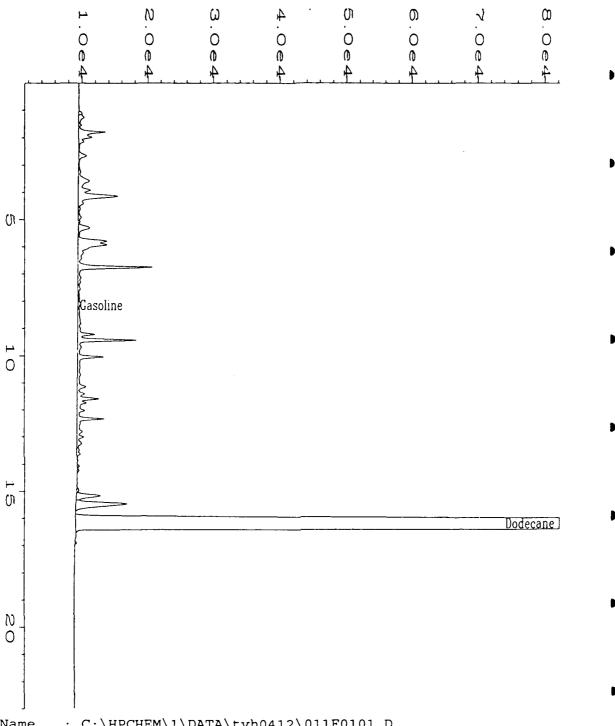
Date Analyzed

: 4/12/95

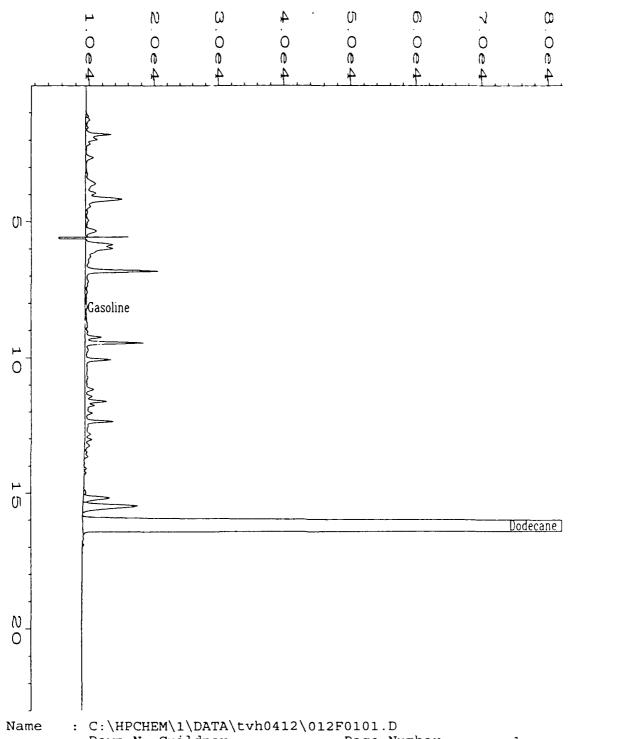
	Spike	Sample	MS	ľ	QC
Compound	Added	Concentration	Concentration	MS	Limits
	(mg/L)	(mg/L)	(mg/L)	%REC	%REC
Gasoline	2.00	0.00	2.07	104%	60-140

	Spike	MSD			C	ıc
Compound	Added	Concentration	MS	RPD	Lir	nits
	(mg/L)	(mg/L)	%REC		RPD	%REC
Gasoline	2.00	1.95	98%	6	50	60-140

= Values outside	of QC limits.		
RPD:	O out of (1) outside limits.		
Spike Recovery:	O out of (2) outside limits.		
Comments:	NA = Not analyzed/not applicable.	N ₁₀	



Data File Name : C:\HPCHEM\1\DATA\tvh0412\011F0101.D Page Number Vial Number Operator : Dawn N. Guildner Instrument : TVH Sample Name : X05056 MS Injection Number: 1 Run Time Bar Code: Sequence Line : 12 Apr 95 06:01 AM Instrument Method: TVH1BA Acquired on Report Created on: 12 Apr 95 10:04 AM Last Recalib on : 12 APR 95 10:00 AM Analysis Method : TVH0412.MT Sample Amount Multiplier ISTD Amount



Data File Name Operator : Dawn N. Guildner Page Number Instrument : TVH Vial Number : 12 Sample Name : X05056 MSD Injection Number: 1 Time Bar Code: Sequence Line : 1 quired on : 12 Apr 95 06:37 AM
Report Created on: 12 Apr 95 10:05 AM Instrument Method: TVH1BASE.MTH Analysis Method : TVH0412.MTH Last Recalib on : 12 APR 95 10:00 AM Sample Amount Multiplier ISTD Amount

Evergreen Analytical, Inc. 4036 Youngfield, Wheat Ridge, CO 80033 (303) 425-6021

TOTAL VOLATILE HYDROCARBONS TVH Matrix Spike/Matrix Spike Duplicate Data Report

Client Sample No.

: 75MP-8S

Client Project No.

: 722450.21020\MAC

Lab Sample No.

: X05074,75

Lab Project No.

: 95-1044

Date Sampled

: 3/30/95

EPA Method No.
Matrix

: 5030/8015 Mod. : Water

Date Received Date Prepared

: 3/31/95: 4/13/95

Method Blank

: MB041295

Date Analyzed

: 4/13/95

MB041395

	Spike	Sample	MS		QC
Compound	Added	Concentration	Concentration	MS	Limits
	(mg/L)	(mg/L)	(mg/L)	%REC	%REC
Gasoline	2.00	0.00	1.89	95%	60-140

	Spike	MSD				C
Compound	Added	Concentration	MS	RPD	Lis	mits
	(mg/L)	(mg/L)	%REC		RPD	%REC
Gasoline	2.00	1.65	83%	14	50	60-140

* =	Values	outside	of OC	limits

RPD:

O out of (1) outside limits.

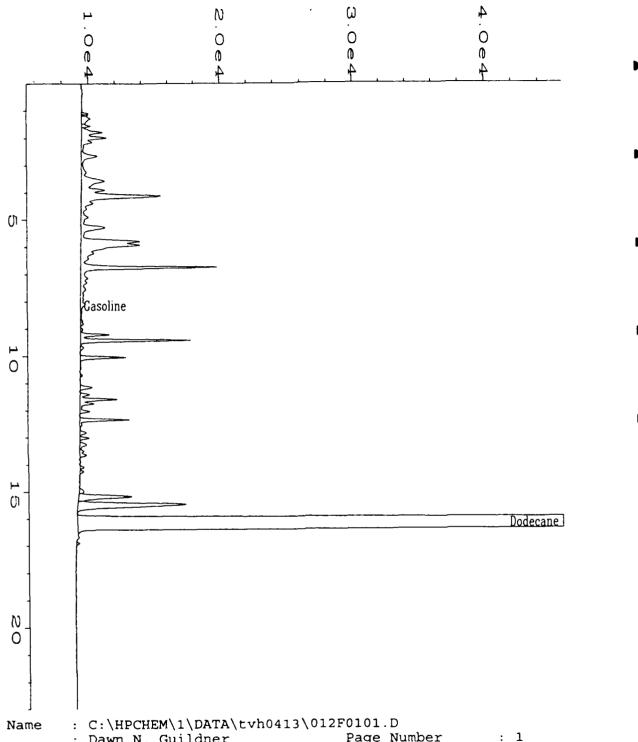
Spike Recovery:

0 out of (2) outside limits.

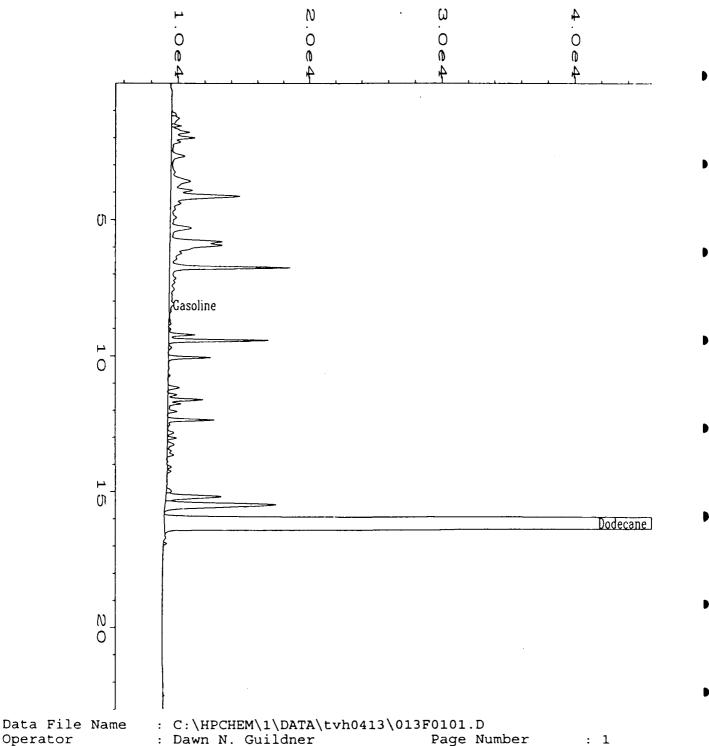
Comments:

NA = Not analyzed/not applicable.

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Data File Name Page Number : Dawn N. Guildner Operator Vial Number : 12 Instrument : TVH Injection Number: 1 Sample Name : X05074 MS : 1 Sequence Line pun Time Bar Code: Instrument Method: TVH1BASE.MTH
Analysis Method : TVH0413.MTH : 13 Apr 95 04:48 PM ruired on keport Created on: 14 Apr 95 09:48 AM Sample Amount Last Recalib on : 13 APR 95 02:21 PM ISTD Amount Multiplier : PROJECT # 95-1044 CLIENT # MATRIX SPIKE WATER Sample Info



Operator Instrument Vial Number : TVH Sample Name Injection Number: 1 : X05075 MSD Run Time Bar Code: Sequence Line Acquired on : 13 Apr 95 05:24 PM Report Created on: 14 Apr 95 09:48 AM Instrument Method: TVH1BA Analysis Method : TVH0413.ac Last Recalib on : 13 APR 95 02:21 PM Sample Amount ISTD Amount Multiplier : 1 : PROJECT # 95-1044 CLIENT # MATRIX SPIKE DUP WATER Sample Info

Method 602 Data Report

Client Sample Number	: Field Blank	Client Project No.	: 722450.21020/MacDill
Lab Sample Number	: X05077	Lab Project No.	: 95-1044
Date Sampled	: 3/30/95	Dilution Factor	: 1.00
Date Received	: 3/31/95	Method	: 602
Date Prepared	: 4/13/95	Matrix	: Water
Date Analyzed	: 4/13/95	Lab File No.	: BX2041316
		Method Blank No.	: MB041395

		Sample		
Compound Name	Cas Number	Concentration	RL	
		ug/L	ug/L	
Benzene	71-43-2	U	0.4	
Toluene	108-88-3	U	0.4	
Chlorobenzene	108-90-7	U	0.4	
Ethyl Benzene	100-41-4	U	0.4	
Total Xylenes	108-38-3, 106-42-3	U	0.4	
_ (m, p & o)	and 95-47-6			
(m, p & o) 1,3,5-Trimethylbenzene	108-67-8	U	0.4	
1,2,4-Trimethylbenzene	95-63-6	U	0.4	
1,2,3-Trimethylbenzene	526-73-8	υ	0.4	
1,2,3,4-Tetramethylbenzene	488-23-3	U	0.4	

84%

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

Surrogate Recovery (α,α,α-Trifluorotoluene):

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

B = Compound also found in the blank.

J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

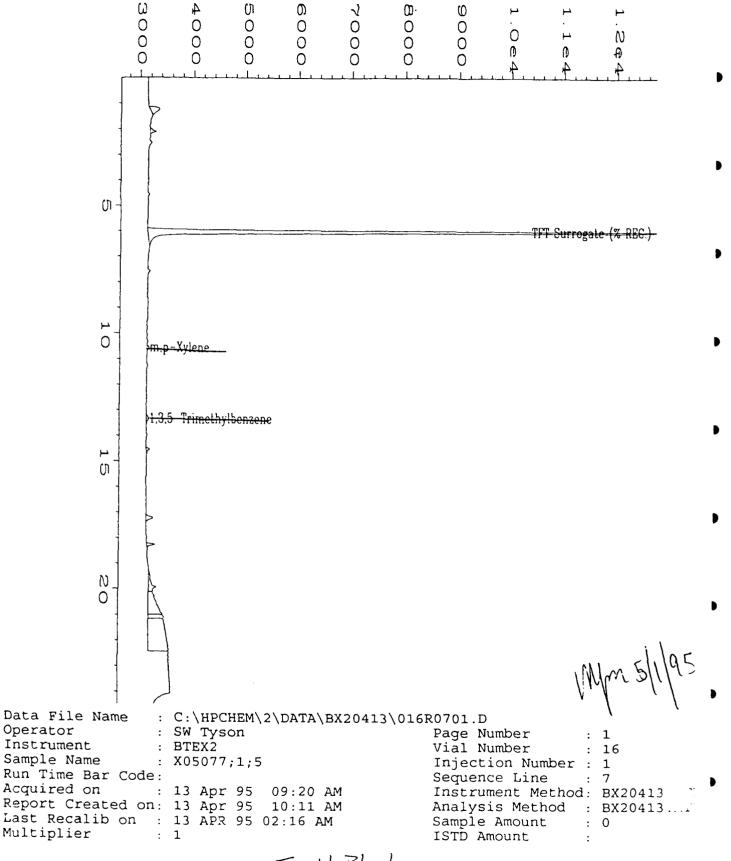
RL = Reporting Limit.

iA = Not Available/Not Applicable.

Analyst

Approved

70%-130% (QC limits)



Field Blank

Operator

Method 602 Data Report

Client Sample Number	: Rinseate Blank	Client Project No.	: 722450.21020/MacDiil
Lab Sample Number	: X05076	Lab Project No.	: 95-1044
Date Sampled	: 3/30/95	Dilution Factor	: 1.00
Date Received	: 3/31/95	Method	: 602
Date Prepared	: 4/13/95	Matrix	: Water
Date Analyzed	: 4/13/95	Lab File No.	: BX2041315
		Method Blank No.	: MB041395

		Sample		
Compound Name	Cas Number	Concentration	RL	
		ug/L	ug/L	
Benzene	71-43-2	U	0.4	
Toluene	108-88-3	U	0.4	
Chlorobenzene	108-90-7	U	0.4	
Ethyl Benzene	100-41-4	U	0.4	
Total Xylenes	108-38-3, 106-42-3	U	0.4	
(m, p & o)	and 95-47-6			
1,3,5-Trimethylbenzene	108-67-8	U	0.4	
1,2,4-Trimethylbenzene	95-63-6	υ	0.4	
1,2,3-Trimethylbenzene	526-73-8	U	0.4	
1,2,3,4-Tetramethylbenzene	488-23-3	U	0.4	

Surrogate Recovery (α,α,α -Trifluorotoluene):

92%

70%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

B = Compound also found in the blank.

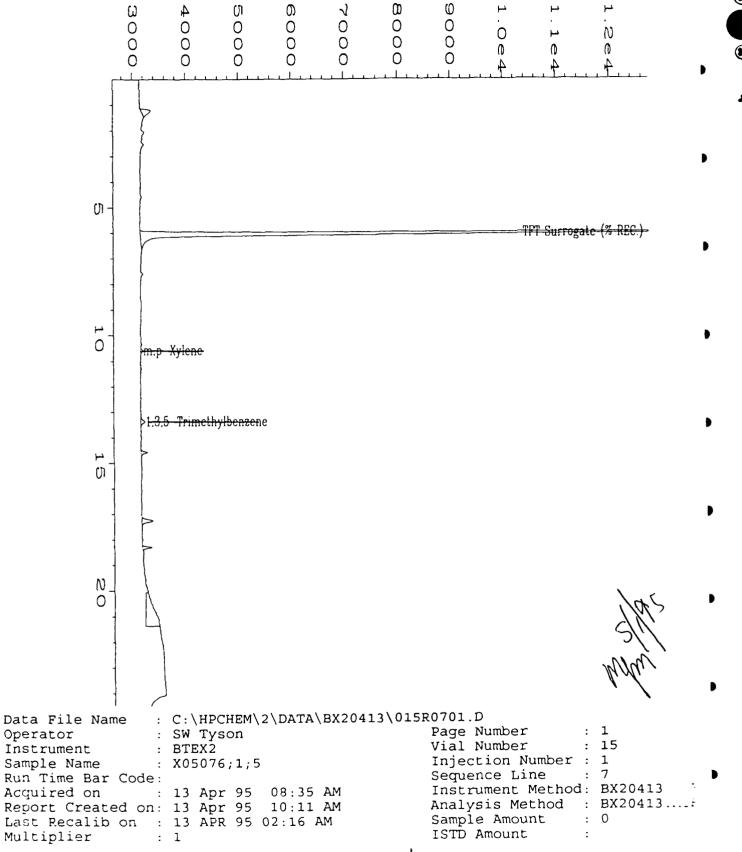
J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

RL = Reporting Limit.

√A = Not Available/Not Applicable.

Analyst

Approved



Rinseate Blank

Operator

Method 602 Data Report

Client Sample Number	: Trip Blank	Client Project No.	: 722450.21020/MacDill
Lab Sample Number	: X05070	Lab Project No.	: 95-1044
Date Sampled	: NA	Dilution Factor	: 1.00
Date Received	: 3/31/95	Method	: 602
Date Prepared	: 4/12/95	Matrix	: Water
Date Analyzed	: 4/12/95	Lab File No.	: BX1041224
		Method Blank No.	: MB041295

		Sample		
Compound Name	Cas Number	Concentration	RL	
		ug/L	_ug/L	_
Benzene	71-43-2	U	0.4	
Toluene	108-88-3	U	0.4	
Chlorobenzene	108-90-7	υ	0.4	
Ethyl Benzene	100-41-4	U	0.4	
Total Xylenes	108-38-3, 106-42-3	U	0.4	
(m, p & o)	and 95-47-6			
1,3,5-Trimethylbenzene	108-67-8	U	0.4	
1,2,4-Trimethylbenzene	95-63-6	U	0.4	
1,2,3-Trimethylbenzene	526-73-8	U	0.4	
1,2,3,4-Tetramethylbenzene	488-23-3	υ	0.4	

Surrogate Recovery (\alpha, \alpha, \alpha - Trifluorotoluene):

77%

70%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

B = Compound also found in the blank.

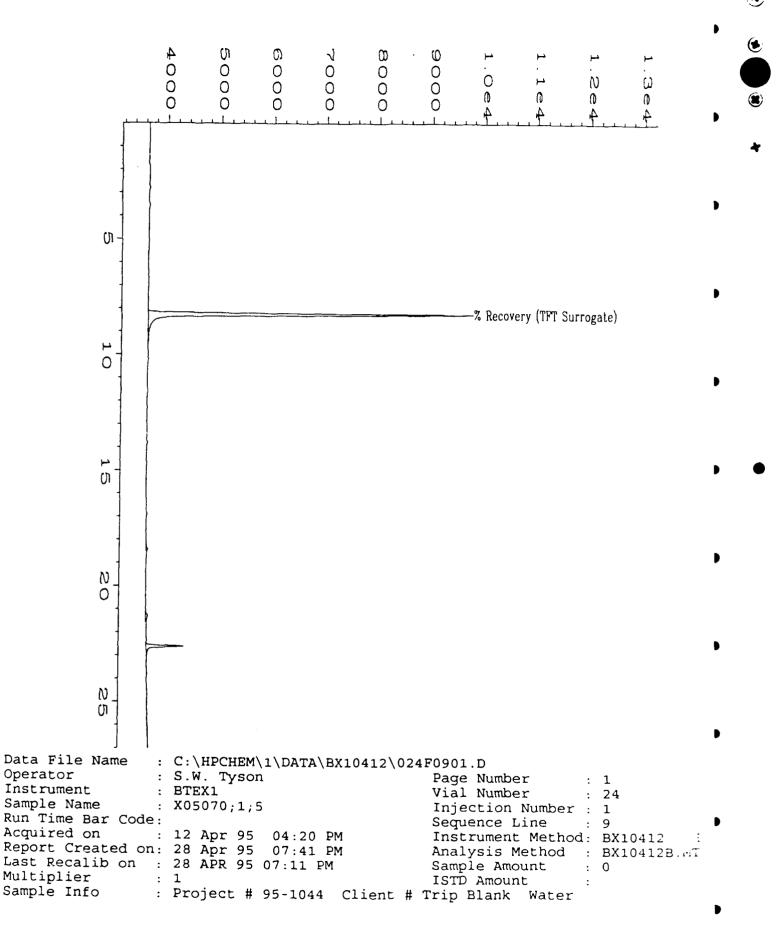
J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

RL = Reporting Limit.

A = Not Available/Not Applicable.

Analyst

Approved



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Method 602 Data Report

Client Sample Number	: Trip Blank	Client Project No.	: 722450.21020/MacDill
Lab Sample Number	: X05084	Lab Project No.	: 95-1044
Date Sampled	: NA	Dilution Factor	: 1.00
Date Received	: 3/31/95	Method	: 602
Date Prepared	: 4/13/95	Matrix	: Water
Date Analyzed	: 4/13/95	Lab File No.	: BX2041326
		Method Blank No.	: MB041395

Compound Name	Cas Number	Sample Concentration ug/L	RL ug/L	
Benzene	71-43-2	U	0.4	
Toluene	108-88-3	U	0.4	
Chlorobenzene	108-90-7	U	0.4	
Ethyl Benzene	100-41-4	U	0.4	
Total Xylenes	108-38-3, 106-42-3	U	0.4	
(m, p & o)	and 95-47-6			
1,3,5-Trimethylbenzene	108-67-8	U	0.4	
1,2,4-Trimethylbenzene	95-63-6	U	0.4	
1,2,3-Trimethylbenzene	526-73-8	U	0.4	
1,2,3,4-Tetramethylbenzene	488-23-3	U	0.4	

84%

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

Surrogate Recovery (\alpha, \alpha, \alpha-Trifluorotoluene):

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

B = Compound also found in the blank.

J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

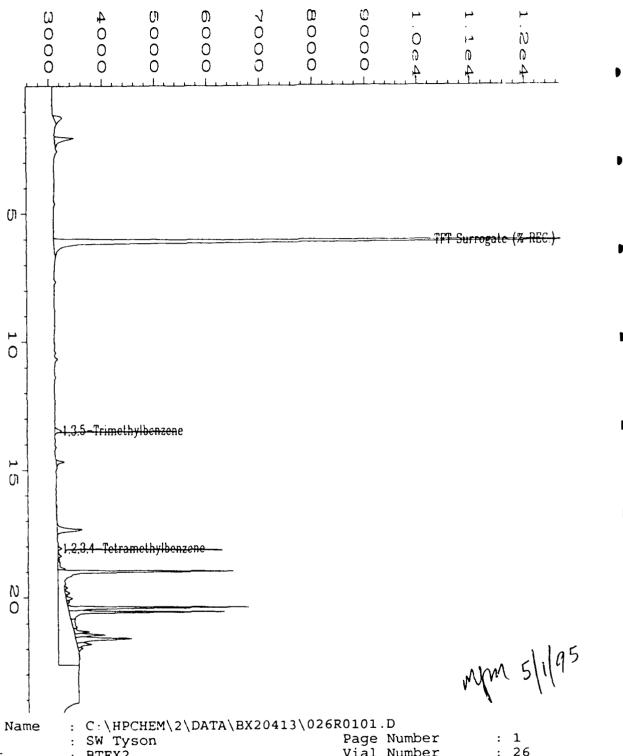
TL = Reporting Limit.

.A = Not Available/Not Applicable.

Appro

\Approved\

70%-130% (QC limits)



Data File Name Operator : 26 Vial Number : BTEX2 Instrument Injection Number: 1 Sample Name : X05084;1;5 : 1 Sequence Line Run Time Bar Code: Acquired on : 13 Apr 95 05:00 PM Report Created on: 13 Apr 95 05:25 PM Instrument Method: BX20413 Analysis Method : BX20413.MIH Sample Amount Last Recalib on : 13 APR 95 02:16 AM ISTD Amount : 1 Multiplier : Project # 95-1044 Client # Trip Blank Water Sample Info

Method 602 Data Report Method Blank Report

Method Blank Number

: MB041295

Client Project No.

: 722450.21020/MacDill

Date Prepared

: 4/12/95

Lab Project No.

: 95-1044

: 1.00

Date Analyzed : 4/12/95 **Dilution Factor** Method

: 602/8020

Matrix

: Water

Lab File No.

: BX1041211

Sample

		Sample		
Compound Name	Cas Number	Concentration	RL	
		ug/L	ug/L	
Benzene	71-43-2	Ü	0.4	
Toluene	108-88-3	0.7	0.4	
Chlorobenzene	108-90-7	U	0.4	
Ethyl Benzene	100-41-4	U	0.4	
Total Xylenes	108-38-3, 106-42-3	0.4	0.4	
(m, p & o)	and 95-47-6			
₹,3,5-Trimethylbenzene	108-67-8	U	0.4	
1,2,4-Trimethylbenzene	95-63-6	U	0.4	
1,2,3-Trimethylbenzene	526-73-8	U	0.4	
1,2,3,4-Tetramethylbenzene	488-23-3	U	0.4	

Surrogate Recovery (\alpha, \alpha, \alpha - Trifluorotoluene):

90%

70%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

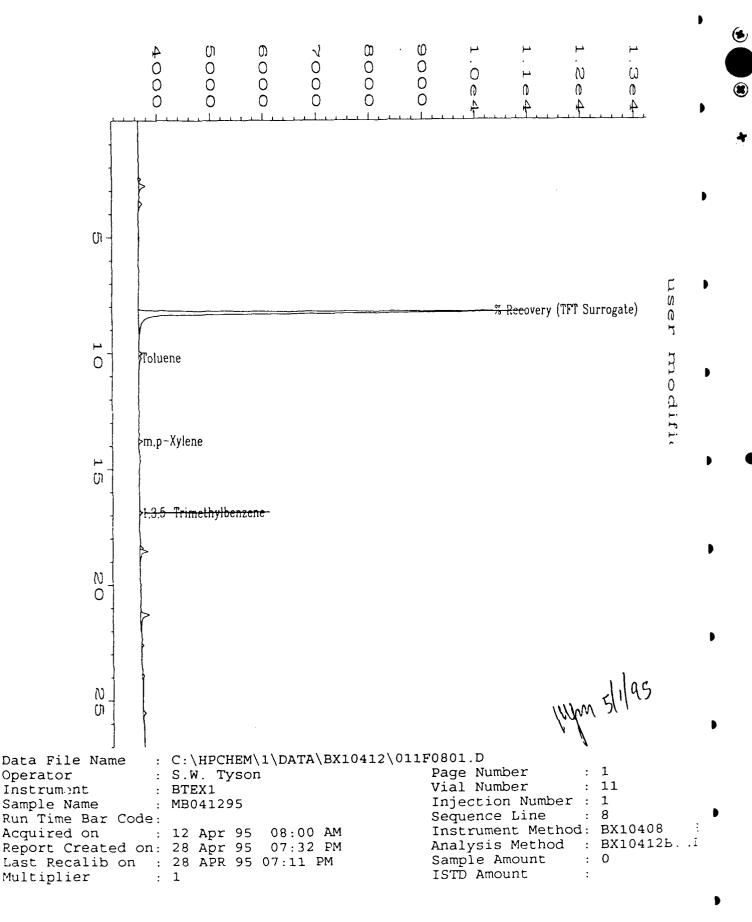
U = Compound analyzed for, but not detected.

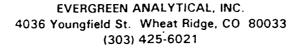
B = Compound also found in the blank.

J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

RL = Reporting Limit.

4 = Not Available/Not Applicable.





Method 602 Data Report Method Blank Report

Method Blank Number

: MB041395

Client Project No.

: 722450.21020/MacDill

Date Prepared

: 4/13/95

Lab Project No.

: 95-1044

Date Analyzed

: 4/13/95

Dilution Factor

: 1.00

Method

: 602/8020

Matrix

: Water

Lab File No.

: BX2041309

Cas Number	Sample Concentration ug/L	RL ug/L	
71-43-2	Ú	0.4	
108-88-3	U	0.4	
108-90-7	U	0.4	
100-41-4	U	0.4	
108-38-3, 106-42-3	U	0.4	
108-67-8	U	0.4	
95-63-6	U	0.4	
526-73-8	U	0.4	
488-23-3	U	0.4	
	71-43-2 108-88-3 108-90-7 100-41-4 108-38-3, 106-42-3 and 95-47-6 108-67-8 95-63-6 526-73-8	Cas Number Concentration ug/L 71-43-2 U 108-88-3 U 108-90-7 U 100-41-4 U 108-38-3, 106-42-3 and 95-47-6 108-67-8 U 95-63-6 U 526-73-8 U	Cas Number Concentration ug/L RL ug/L 71-43-2 U 0.4 108-88-3 U 0.4 108-90-7 U 0.4 100-41-4 U 0.4 108-38-3, 106-42-3 and 95-47-6 108-67-8 U 0.4 95-63-6 U 0.4 526-73-8 U 0.4

Surrogate Recovery (\alpha, \alpha, \alpha - Trifluorotoluene):

99%

70%-130% (QC limits)

Note: Total Xylenes consist of three isomers, two of which co-elute.

The Xylene RL is for a single peak.

QUALIFIERS:

E = Extrapolated value.

U = Compound analyzed for, but not detected.

B = Compound also found in the blank.

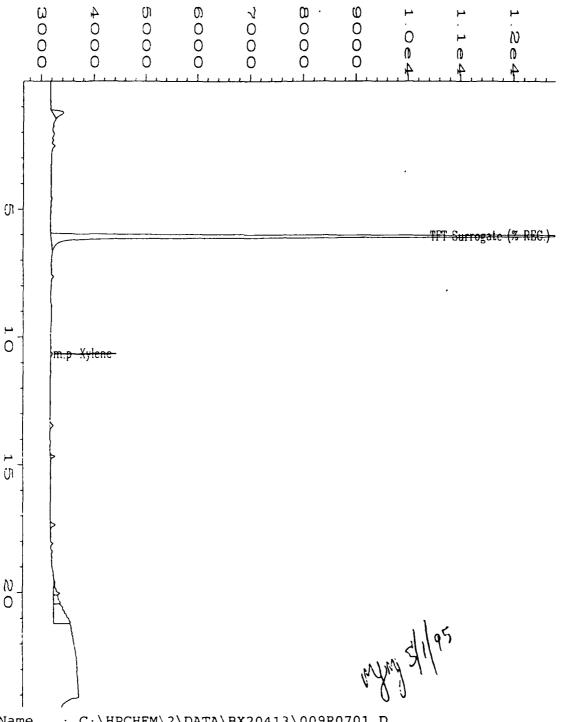
J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

9L = Reporting Limit.

A = Not Available/Not Applicable.

Analyst

K. ane
Approved



Data File Name : C:\HPCHEM\2\DATA\BX20413\009R0701.D Page Number)perator : SW Tyson Vial Number nstrument : BTEX2 Injection Number: 1 ample Name : MB041395 : 7 un Time Bar Code: Sequence Line cquired on : 13 Apr 95 04:04 AM eport Created on: 13 Apr 95 09:48 AM ast Recalib on : 13 APR 95 02:16 AM .cquired on Instrument Method: BX20413.M' Analysis Method : BX20413.MTn Sample Amount : 0 ISTD Amount ultiplier : 1

TOTAL VOLATILE HYDROCARBONS (TVH) Laboratory Control Sample (LCS)

LCS Number

: LCS041295

Matrix

: WATER

Date Prepared

: 4/11/95

Method Number

: 5030/MOD.8015

Date Analyzed Sequence Number : 4/12/95

: TVH8

Compound

Name

Theoretical Concentration mg/L

LCS Concentration mg/ L LCS % Recovery

QC Limit
% Recovery

Gasoline

5.00

5.22

104%

70%-130%

QUALIFIERS

U = TVH analyzed for but not detected.

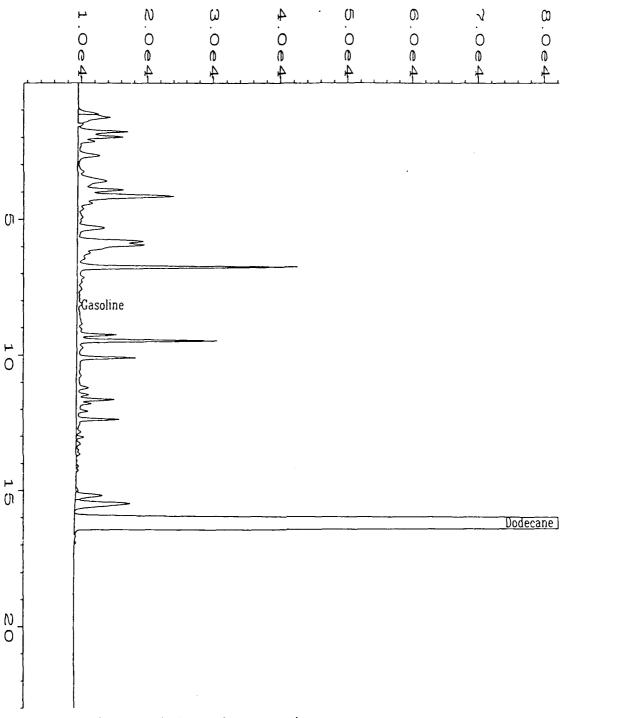
B = TVH found in blank as well as sample (blank data should be compared).

E = Extrapolated value.

NA = Not Available.

Analyst

Approved



Data File Name : C:\HPCHEM\1\DATA\tvh0412\008F0101.D Operator : Dawn N. Guildner Page Number Instrument : TVH Vial Number : LCS041295 Injection Number: 1 Sample Name Run Time Bar Code: : 1 Sequence Line Instrument Method: TVH1BASE : 12 Apr 95 04:13 AM Acquired on Report Created on: 12 Apr 95 10:04 AM Analysis Method : TVH0412.M1H Last Recalib on : 12 APR 95 10:00 AM Sample Amount : 0 ISTD Amount Multiplier

TOTAL VOLATILE HYDROCARBONS (TVH) Laboratory Control Sample (LCS)

LCS Number

: LCS041395

Matrix

: WATER

Date Prepared
Date Analyzed

: 4/12/95 : 4/13/95 Method Number

: 5030/MOD.8015

Sequence Number

: TVH8

Compound Name	•		LCS % Recovery	QC Limit % Recovery
Gasoline	5.00	5.17	103%	70%-130%

QUALIFIERS

U = TVH analyzed for but not detected.

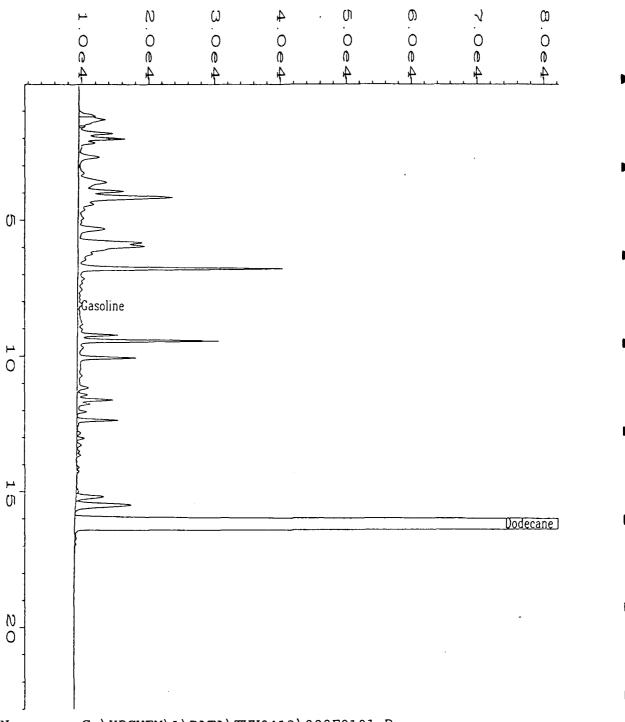
B = TVH found in blank as well as sample (blank data should be compared).

E = Extrapolated value.

NA = Not Available.

Analyst

Approved



: C:\HPCHEM\1\DATA\TVH0413\008F0101.D Data File Name Operator : Dawn N. Guildner Page Number : 1 Vial Number Instrument : TVH Sample Name : LCS041395 Injection Number: 1 Run Time Bar Code: Sequence Line Instrument Method: TVH1BASF Acquired on : 13 Apr 95 02:24 PM Report Created on: 13 Apr 95 Analysis Method : TVH0413..... 02:48 PM Last Recalib on : 13 Apr 95 Sample Amount : 0 02:21 PM ISTD Amount : 1 Multiplier

Anions

Date Prepared: 3/31/95

Date Prepared: 3/31/95

Method: EPA 300.0

Date Analyzed: 3/31/95

Matrix: Water

Detection Limit : 0.250 mg/L

Evergreen Sample #	Client <u>Sample ID</u>	Chloride (mg/L)
X05056	56MP-2S	45.3
X05057	56MP-7S	32.8
X05060	MD56-MW4	24.9
X05063	MD75-MW5	12.3
X05066	MD75-MW1	6.27
X05067	75MP-5D	10.3
X05068	75MP-6D	12.2
X05069	MD75-MW2	12.6
X05071	75MP-8D	12.6
X05072	75MP-8S	12.5
X05072 dup	75MP-8S dup	12.5
Method blank	(3-31-95)	<0.250

Quality Assurance

		Spike Amount (mg/L)	Sample Result <u>(mg/L)</u>	Spike Result <u>(mg/L)</u>	% <u>Recovery</u>
X05074	75MP-8S Matrix Spike	10.0	12.5	23.4	109
X05075	75MP-8S Matrix Spike Dup	10.0	12.5	22.9	104
	MS/MSD RPD				4.89
X05072/X0507	2 Dup RPD				0.160

Analyst

Approved

1044cm.25

Anions

Date Received: 3/31/95 Lab Project No. : 95-1044
Date Prepared: 3/31/95 Method : EPA 300.0
Date Analyzed: 3/31/95 Matrix : Water

Detection Limit : 0.250 mg/L

Evergreen Client Sample # Sample ID Chloride (mg/L) X05073 75MP-28S 12.2 X05078 75MP-9D 4.80 X05079 75MP-9S 8.20 X05080 MD75-MW13 14.9 X05081 MD75-MW11 20.8 X05082 MD75-MW10 9.01 X05083 MD75-MW9 8.21

Analyst

Approved

1044tm.25

<u>Anions</u>

Date Prepared: 3/31/95 Method: EPA 300.0
Date Analyzed: 3/31/95 Matrix: Water

Detection Limit : 0.076 mg/L

Evergreen Sample #	Client <u>Sample ID</u>	Nitrite-N (mg/L)
X05056	56MP-2S	<0.076
X05057	56MP-7S	<0.076
X05060	MD56-MW4	<0.076
X05063	MD75-MW5	<0.076
X05066	MD75-MW1	<0.076
X05067	75 M P-5D	<0.076
X05068	75MP-6D	<0.076
X05069	MD75-MW2	<0.076
X05071	75MP-8D	<0.076
X05072	75MP-8S	<0.076
X05072 dup	75MP-8S dup	<0.076
Method blank	(3-31-95)	<0.076

Quality Assurance**

		Spike Amount <u>(mg/L)</u>	Sample Result (mg/L)	Spike Result (mg/L)	% <u>Recovery</u>
	5MP-8S atrix Spike	10.0	<0.250	10.2	102
	5MP-8S atrix Spike Dup	10.0	<0.250	9.86	98.6
MS	S/MSD RPD			•	3.68
X05072/X05072 I	Dup RPD				NC

** = Quality assurance results reported as Nitrite (NO_2) .

NC = Not calculated because sample and/or duplication results below detection limit.

Analyst

Approved

1044tm.25

EVERGREEN ANALYTICAL, INC. 4036 Youngfield St. Wheat Ridge, CO 80033 (303)425-6021

Anions

722450.21020

Client Project ID. : /MacDill AFB Lab Project No.

Date Sampled : 3/29,30/95
Date Received : 3/31/95
Date Prepared : 3/31/95 : 95-1044 Method : EPA 300.0 Date Analyzed: 3/31/95 Matrix : Water

Detection Limit : 0.076 mg/L

Evergreen Client Sample # Sample ID Nitrite-N (mg/L) X05073 75MP-28S <0.076 X05078 75MP-9D <0.076 X05079 75MP-9S <0.076 X05080 MD75-MW13 <0.076 X05081 MD75-MW11 <0.076 X05082 MD75-MW10 <0.076 X05083 MD75-MW9 <0.076

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EVERGREEN ANALYTICAL, INC. 4036 Youngfield St. Wheat Ridge, CO 80033 (303)425-6021

Anions

						122450.21020
Date	Sampled	:	3/29,30/95	Client Project ID.	:	/MacDill AFB
Date	Received	:	3/31/95	Lab Project No.	:	95-1044

Date Received: 3/31/95 Lab Project No. : 95-1044
Date Prepared: 3/31/95 Method : EPA 300.0
Date Analyzed: 3/31/95 Matrix : Water

Detection Limit : 0.056 mg/L

Evergreen Sample #	Client <u>Sample ID</u>	Nitrate-N (mg/L)
X05056	56MP-2S	<0.056
X05057	56MP-7S	<0.056
X05060	MD56-MW4	0.195
X05063	MD75-MW5	<0.056
X05066	MD75-MW1	<0.056
X05067	75MP-5D	<0.056
X05068	75MP-6D	<0.056
X05069	MD75-MW2	0.080
X05071	75MP-8D	0.060
X05072	75MP-8S	0.990
X05072 dup	75MP-8S dup	0.973
Method blank	(3-31-95)	<0.056

Quality Assurance**

		Spike Amount (mg/L)	Sample Result <u>(mg/L)</u>	Spike Result (mg/L)	% Recovery
X05074	75MP-8S Matrix Spike	10.0	4.38	14.5	101
X05075	75MP-8S Matrix Spike Dup	10.0	4.38	13.6	91.9
	MS/MSD RPD				9.53
X05072/X0507	72 Dup RPD				1.61

** = Quality assurance results reported as Nitrate (NO₃).

Analyst

Approved

1044tm 25

EVERGREEN ANALYTICAL, INC. 4036 Youngfield St. Wheat Ridge, CO 80033 (303)425-6021

Anions

722450.21020

Date Sampled: 3/29,30/95 Client Project ID.: /MacDill AFB

Date Received: 3/31/95 Lab Project No. : 95-1044
Date Prepared: 3/31/95 Method : EPA 300.0
Date Analyzed: 3/31/95 Matrix : Water

Detection Limit : 0.056 mg/L

Evergreen Sample #	Client <u>Sample ID</u>	Nitrate-N (mg/L)
X05073	75MP-28S	0.959
X05078	75MP-9D	<0.056
X05079	75MP-9S	<0.056
X05080	MD75-MW13	<0.056
X05081	MD75-MW11	<0.056
X05082	MD75-MW10	<0.056
X05083	MD75-MW9	0.069

Analyst

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1044tm 25

EVERGREEN ANALYTICAL, INC. 4036 Youngfield St. Wheat Ridge, CO 80033 (303)425-6021

Anions

722450.21020 Date Sampled : 3/29,30/95
Date Received : 3/31/95
Date Prepared : 3/31/95 Client Project ID. : /MacDill AFB Lab Project No. : 95-1044

Method : EPA 300.0 Date Analyzed : 3/31/95 Matrix : Water

Detection Limit : 0.250 mg/L

Evergreen Sample #	Client <u>Sample ID</u>	Sulfate (mg/L)
X05056	56MP-2S	331
X05057	56MP-7S	108
X05060	MD56-MW4	104
X05063	MD75-MW5	27.8
X05066	MD75-MW1	15.2
X05067	75MP-5D	7.41
X05068	75MP-6D	2.16
X05069	MD75-MW2	25.8
X05071	75MP-8D	9.21
X05072	75MP-8S	28.4
X05072 dup	75MP-8S dup	28.5
Method blan	(3-31-95)	<0.250

Quality Assurance

			Spike Amount (mg/L)	Sample Result (mg/L)	Spike Result (mg/L)	% Recovery
X05074	75MP-8 Matrix	=	10.0	28.4	39.4	110
X05075	75MP-8 Matrix	S Spike Dup	10.0	28.4	39.3	109
	MS/MSD	RPD				0.547
X05072/X0507	2 Dup	RPD				0.246

Analyst

Approved 1044tm.25

EVERGREEN ANALYTICAL, INC. 4036 Youngfield St. Wheat Ridge, CO 80033 (303)425-6021

<u>Anions</u>

Evergreen Client Sample # Sample ID Sulfate (mg/L) X05073 75MP-28S 28.9 X05078 75MP-9D 12.1 X05079 75MP-9S 20.2 X05080 MD75-MW13 30.7 X05081 MD75-MW11 65.8 X05082 MD75-MW10 10.3 X05083 MD75-MW9 1.46

Analyst

Approved

1044tm.25

EVERGREEN ANALYTICAL, INC. 4036 Youngfield St. Wheat Ridge, CO 80033 (303)425-6021

Miscellaneous Analyses

722450.21020

Client Project ID. : /MacDill AFB Date Sampled : 3/29,30/95 Date Received : 3/31/95

Lab Project No. : 95-1044

Matrix Date Prepared: 3/31/95 : 5.00 mgCaCO₃/L

Date Analyzed: 3/31/95 Method : EPA 310.1

Evergreen Sample #	Client <u>Sample ID</u>	<u>Matrix</u>	Total Alkalinity (mgCaCO3/L)
X05057	56MP-7S	Water	152
X05060	MD56-MW4	Water	166
X05063	MD75-MW5	Water	119
X05072	75MP-8S	Water	116
X05072 Dup	75MP-8S Dup	Water	117
X05073	75MP-28S	Water	117
X05081	MD75-MW11	Water	41.8
Method Blank	(3/31/95)		<5.00

Quality Assurance

	True Value (mgCaCO ₃ /L)	Result (mgCaCO ₃ /L)	% Recovery
APG Minerals Reference Lot #13862	11.8	11.1	93.4

Approved

1044tm 4

EVERGREEN ANALYTICAL, INC. 4036 Youngfield St. Wheat Ridge, CO 80033 (303)425-6021

Total Organic Carbon

722450-21020

Date Sampled : 3/29,30/95 Client Project ID. : /MacDill AFB Date Received : 3/31/95 Lab Project No. : 95-1044

Date Prepared: 4/3/95 Method: EPA 415.1
Date Analyzed: 4/3/95 Detection Limit: 1.00 mgC/L

Evergreen Sample #	Client <u>Sample ID</u>	<u>Matrix</u>	mg C/Liter
X05057	56MP-7S	Water	20.0
X05060	MD56-MW4	Water	10.5
X05063	MD75-MW5	Water	7.42
X05072	75MP-8S	Water	5.18
X05072 dup	75MP-8S dup	Water	5.24
X05073	75MP-28S	Water	5.28
X05079	75MP-9S	Water	4.68
Method Blank	4/3/95		<1.00

Quality Assurance

	True Value	Result	%
	_(mg_C/L)	(mg_C/L)	Recovery
Spex Demand Reference	40.9	45.9	112

Analyst Analyst

Lot 2-7 DEM

Approved

1044tm.10

EVERGREEN ANALYTICAL, INC. 4036 Youngfield St. Wheat Ridge, CO 80033 (303) 425-6021

BTEX Data Report Laboratory Control Sample (LCS)

LCS Number : LCS041295 Date Extracted/Prepared : 4/12/95 **Date Analyzed**

Dilution Factor Method

: 1.00 : 602 : Water

Spike Amount (ug/L)

: 4/12/95 : 20.0

Matrix Lab File No.

: BX1041210

Compound Name	Cas Number	LCS Concentration ug/L	LCS % Recovery	QC Limit % Recovery
Benzene	71-43-2	16.5	82.5	71.0-119.0*
Toluene	108-88-3	16.5	82.5	73.0-111.0 *
Chlorobenzene	108-90-7	17.4	87.0	64.0-119.0*
Ethyl Benzene	100-41-4	17.0	85.0	75.0-114.0*
m,p-Xylene	108-38-3	17.2	86.0	75.0-114.0*
o-Xylene	106-42-3 95-47-6	16.5	82.5	64.0-119.0 *
1,3,5-Trimethylbenzene	108-67-8	16.3	81.5	50.0-150.0
1,2,4-Trimethylbenzene	95-63-6	17.3	86.5	50.0-150.0
1,2,3-Trimethylbenzene	526-73-8	21.5	107.5	50.0-150.0
1,2,3,4-Tetramethylbenzene	488-23-3	17.6	88.0	50.0-150.0
Surrogate Recovery (\alpha, \alpha, \alpha - Trifluor	otoluene):	97%	70%-130%	(QC limits)

= Limits established 4/3/95 KSC

QUALIFIERS:

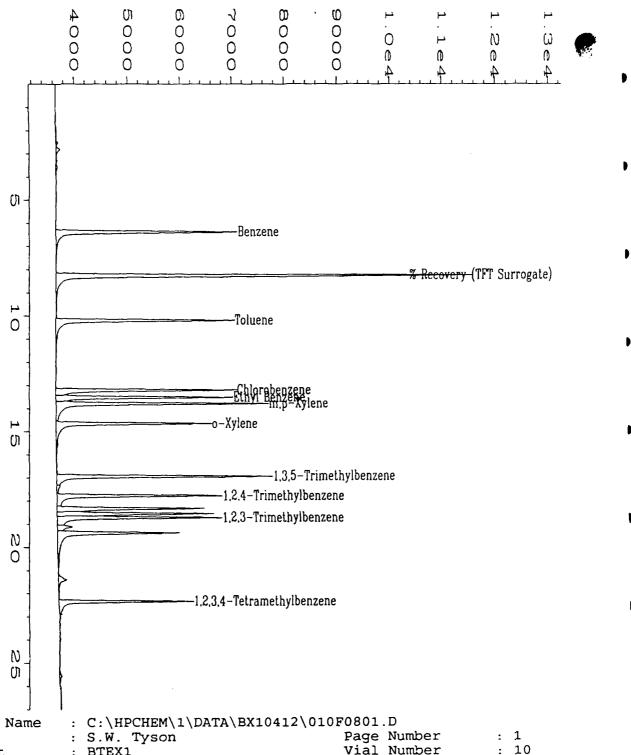
E = Extrapolated value

U = Compound analyzed for, but not detected.

B = Compound found in blank and sample. Compare blank and sample data.

J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

NA = Not available/Not analyzed.



Data File Name Operator : 10 Vial Number Instrument : BTEX1 Injection Number: 1 Sample Name : LCS041295 : 8 Sequence Line Run Time Bar Code: Instrument Method: BX10408. Acquired on : 12 Apr 95 07:21 AM : BX10412B.mi Analysis Method Report Created on: 28 Apr 95 07:26 PM Sample Amount Last Recalib on : 28 APR 95 07:11 PM Multiplier : 1

ISTD Amount

EVERGREEN ANALYTICAL, INC. 4036 Youngfield St. Wheat Ridge, CO 80033 (303) 425-6021

BTEX Data Report Laboratory Control Sample (LCS)

: LCS041395 **Dilution Factor** : 1.00 LCS Number Date Extracted/Prepared : 4/13/95 Method : 602 : 4/13/95 Matrix : Water Date Analyzed Lab File No. : BX2041308 Spike Amount (ug/L) : 20.0

Compound Name	Cas Number	LCS Concentration ug/L	LCS % Recovery	QC Limit* % Recovery
Benzene	71-43-2	18.0	90.0%	71.0%-119.0%
Toluene	108-88-3	18.7	93.5%	73.0%-111.0%
Chlorobenzene	108-90-7	19.0	95.0%	64.0%-119.0%
Ethyl Benzene	100-41-4	19.3	96.5%	75.0%-114.0%
m,p-Xylene	108-38-3 106-42-3	20.1	101%	75.0%-114.0%
o-Xylene	95-47-6	18.9	94.5%	64.0%-119.0%
1,3,5-Trimethylbenzene	108-67-8	19.7	98.5%	68.0%-101.0%
1,2,4-Trimethylbenzene	95-63-6	20.3	102%	61.0%-88.0%
1,2,3-Trimethylbenzene	526-73-8	15.1	76%	63.0%-101.0%
1,2,3,4-Tetramethylbenzene	488-23-3	19.7	98.5%	58.0%-102.0%
Surrogate Recovery (α,α,α-Trifluor	otoluene):	101%	70%-130%	6 (QC limits)

• = Limits established 4/3/95 KSC

QUALIFIERS:

E = Extrapolated value

U = Compound analyzed for, but not detected.

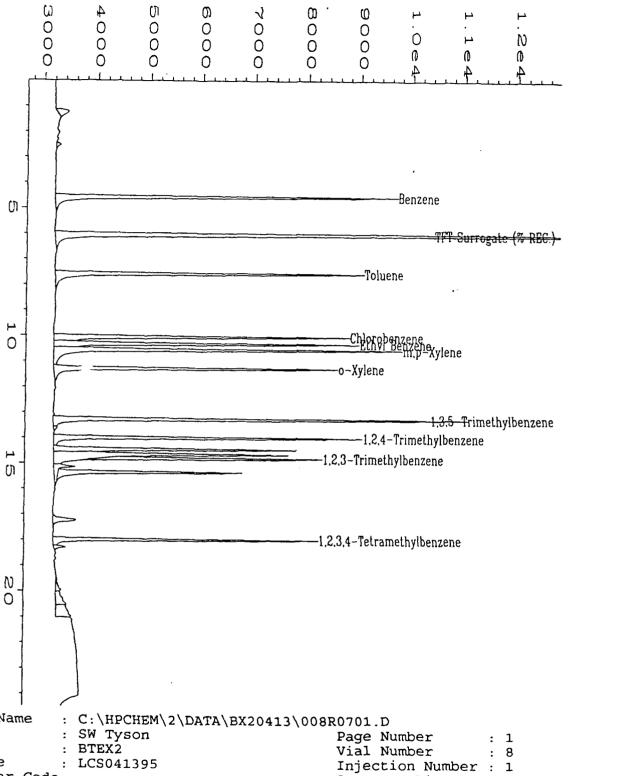
B = Compound found in blank and sample. Compare blank and sample data.

J = Indicates an estimated value when the compound is detected, but is below the Reporting Limit (RL).

NA = Not available/Not analyzed.

Analyst

Approved



Data File Name : C:\HPCHEM\2\DATA\BX20413\008R0701.D

Derator : SW Tyson Page Number : 1

Instrument : BTEX2 Vial Number : 8

Imple Name : LCS041395 Injection Number : 1

un Time Bar Code: Sequence Line : 7

cquired on : 13 Apr 95 03:20 AM Instrument Method: BX20413.M

eport Created on: 13 Apr 95 09:47 AM Analysis Method : BX20413.MTH

ast Recalib on : 13 APR 95 02:16 AM Sample Amount : 0

ultiplier : 1

D

r

EVERGREEN ANALYTICAL, INC. 4036 Youngfield, Wheat Ridge, CO 80033 (303) 425-6021



8

TOTAL VOLATILE HYDROCARBONS (TVH-GASOLINE)

Date Sampled

: 3/29,30/95

Client Project Number

: 722450.21020/MACDILL

Date Received Date Prepared : 3/31/95 : 4/11,13/95

Lab Project Number Matrix : 95-1044 : Water

Date Analyzed

: 4/12,13/95

Method Number

: 5030/Mod.8015

Evergreen	Client	Surrogate	TVH	RL
Sample #	Sample #	Recovery	mg/L	mg/L
MB041295	METHOD BLANK	100%	U	0.1
MB041395	METHOD BLANK	100%	U	0.1
X05056	56MP-2S	100%	U	0.1
X05057	56MP-7S	96%	U	0.1
X05057 DUP	56MP-7S	97%	U	0.1
X05060	MD56-MW4	98%	U	0.1
X05063	MD75-MW5	93%	U	0.1
X05066	MD75-MW1	89%	U	0.1
X05067	75MP-5D	95%	U	0.1
X05068	75MP-6D	92%	0.1	0.1
X05068 DUP	75MP-6D	92%	0.1	0.1
X05069	MD75-MW2	88%	U	0.1
X05071	75MP-8D	84%	U	0.1
X05072	75MP-8S	85%	U	0.1
X05072 DUP	75MP-8S	85%	U	0.1
X05073	75MP-28S	96%	ឋ	0.1
X05078	75MP-9D	99%	υ	0.1
X05079	75MP-9S	99%	U	0.1
X05080	MD75-MW13	73%	U	0.1
X05081	MD75-MW11	97%	U	0.1
X05082	MD75-MW10	95%	0.5	0.1
X05083	MD75-MW9	96%	1.2	0.1
QUALIFIERS				- • ·

QUALIFIERS

U = TVH analyzed for but not detected.

B = TVH found in blank.

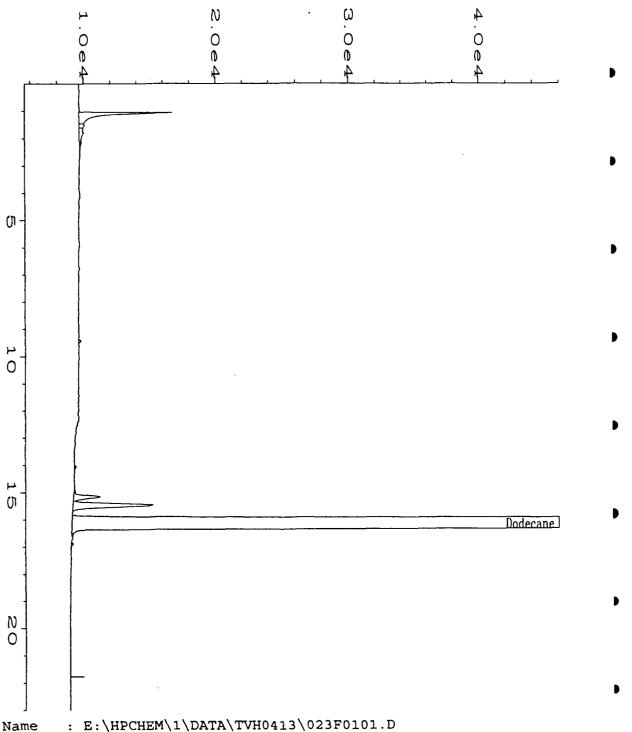
E = Extrapolated value.

RL = Reporting Limit.

Approved

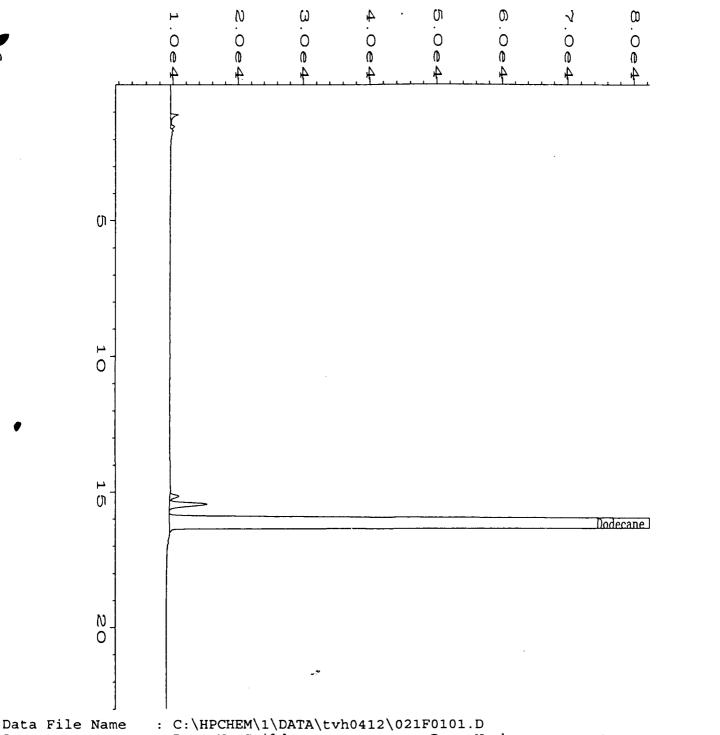
Analyst

TVH1044.XLS

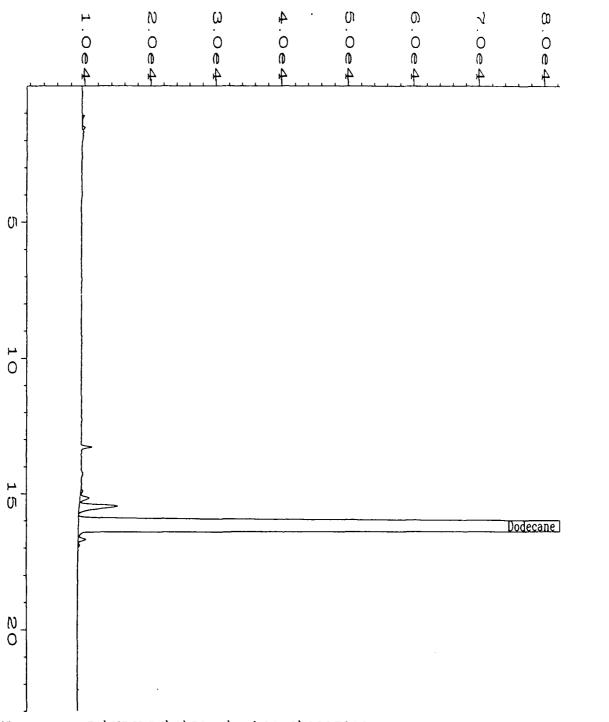


Data File Name Page Number : 1 : Dawn N. Guildner Operator Vial Number : 23 Instrument : TVH Injection Number: 1 Sample Name : X05063;1;5 Sequence Line : 1 Run Time Bar Code: : 13 Apr 95 11:24 PM Instrument Method: TVH1BA: Acquired on Report Created on: 17 Apr 95 09:51 AM Analysis Method : TVH0413.MT Last Recalib on : 13 APR 95 02:21 PM Sample Amount : 0 ISTD Amount Multiplier

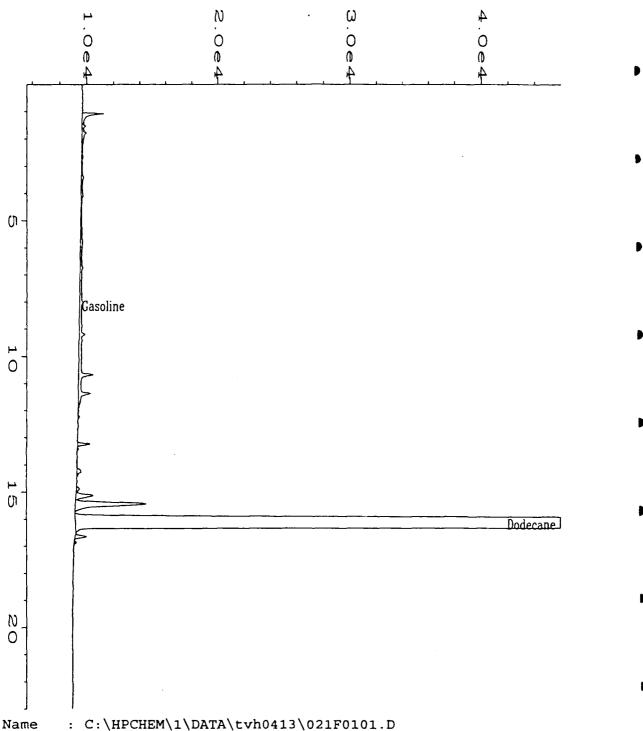
MD75-MW5



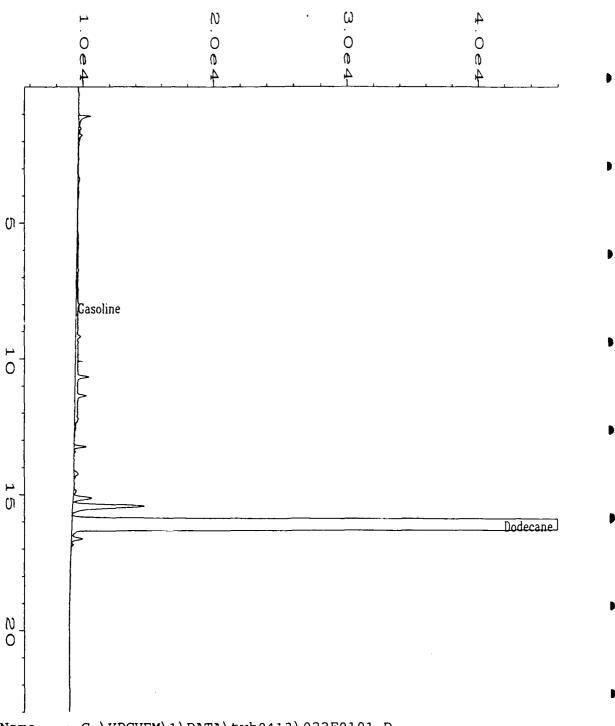
Operator : Dawn N. Guildner Page Number Vial Number Instrument : TVH : 21 Sample Name : x05066;1;5• Injection Number: 1 'n Time Bar Code: Sequence Line : 1 : 12 Apr 95 01:00 PM Instrument Method: TVH1BASE.MTH quired on Analysis Method : TVH0412.MTH Report Created on: 13 Apr 95 09:37 AM Last Recalib on : 12 APR 95 10:00 AM Sample Amount : 0 ISTD Amount Multiplier : 1 : PROJECT # 95-1044 CLIENT # MD75-MW1 WATER Sample Info



```
Data File Name
                  : C:\HPCHEM\1\DATA\tvh0412\022F0101.D
Operator
                  : Dawn N. Guildner
                                                    Page Number
                  : TVH
Instrument
                                                    Vial Number
                                                                      : 22
Sample Name
                  : X05067;1;5
                                                    Injection Number: 1
Run Time Bar Code:
                                                    Sequence Line
                                                                       : 1
Acquired on : 12 Apr 95 01:36 PM Report Created on: 13 Apr 95 09:37 AM
                                                    Instrument Method: TVH1BAS
                                                    Analysis Method : TVH0412.MT
Last Recalib on : 12 APR 95 10:00 AM
                                                    Sample Amount
Multiplier
                                                    ISTD Amount
                  : 1
Sample Info
                  : PROJECT # 95-1044 CLIENT # 75MP-5D WATER
```

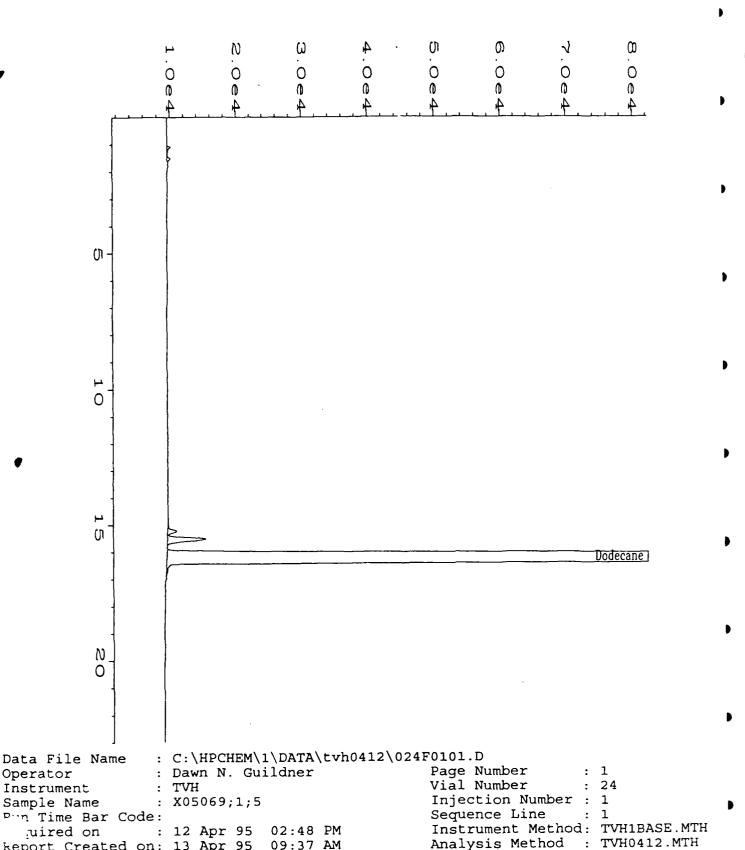


Data File Name Operator : Dawn N. Guildner Page Number Instrument : TVH Vial Number : 21 Sample Name : X05068;1;5 Injection Number : 1 Run Time Bar Code: Sequence Line : 1 uired on : 13 Apr 95 10:12 PM κ -port Created on: 14 Apr 95 09:49 AM Instrument Method: TVH1BASE.MTH Analysis Method : TVH0413.MTH Last Recalib on : 13 APR 95 02:21 PM Sample Amount : 0 Multiplier : 1 ISTD Amount Sample Info : PROJECT # 95-1044 CLIENT # 75MP-6D WATER

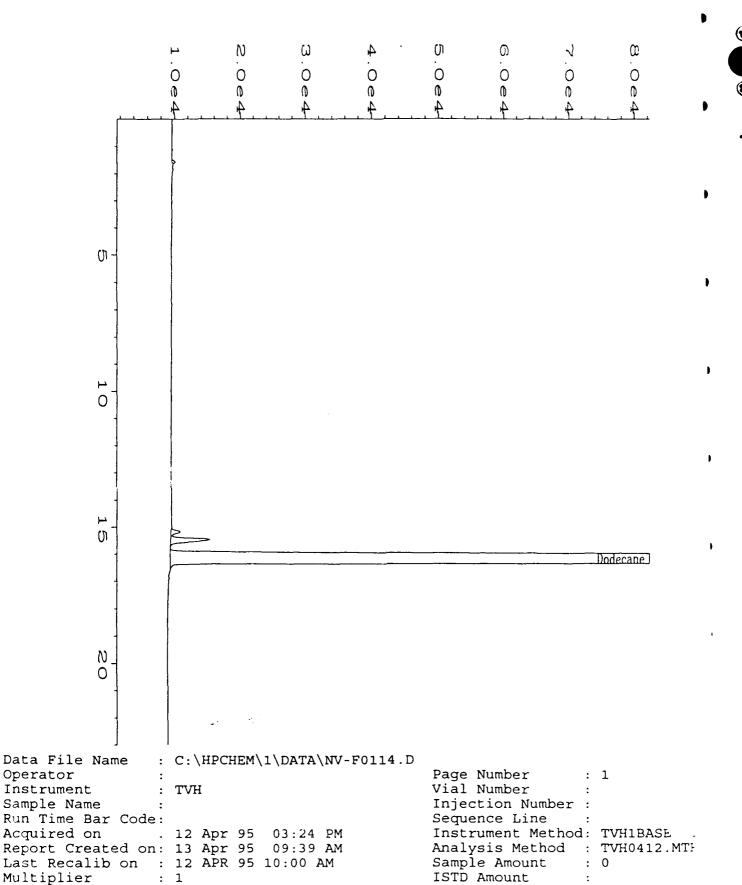


Data File Name :	: C:\HPCHEM\1\DATA\tvh0413\022F0101.D		
Operator :	Dawn N. Guildner	Page Number : 1	
Instrument :	TVH	Vial Number : 22	
Sample Name :	X05068 DUP	Injection Number : 1	
Run Time Bar Code:		Sequence Line : 1	
Acquired on :	13 Apr 95 10:48 PM	Instrument Method: TVH1BA:	
Report Created on:	14 Apr 95 09:50 AM	Analysis Method : TVH0413.47	
Last Recalib on :	13 APR 95 02:21 PM	Sample Amount : 0	
Multiplier :	1	ISTD Amount :	

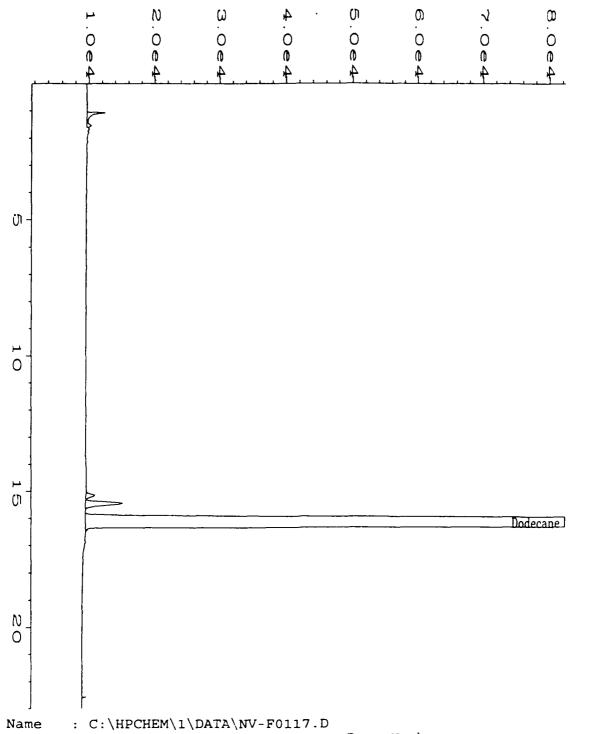
*



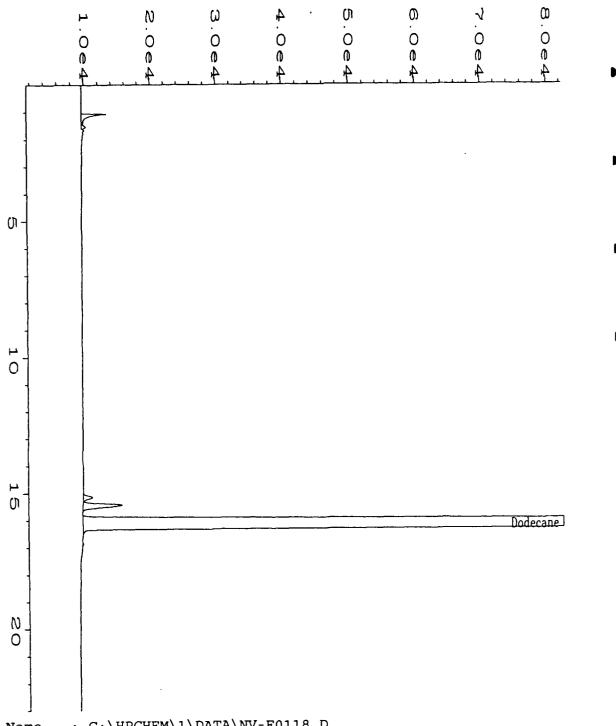
keport Created on: 13 Apr 95 09:37 AM Sample Amount Last Recalib on : 12 APR 95 10:00 AM ISTD Amount Multiplier : PROJECT # 95-1044 CLIENT # MD75-MW2 WATER Sample Info



75 MP-8D



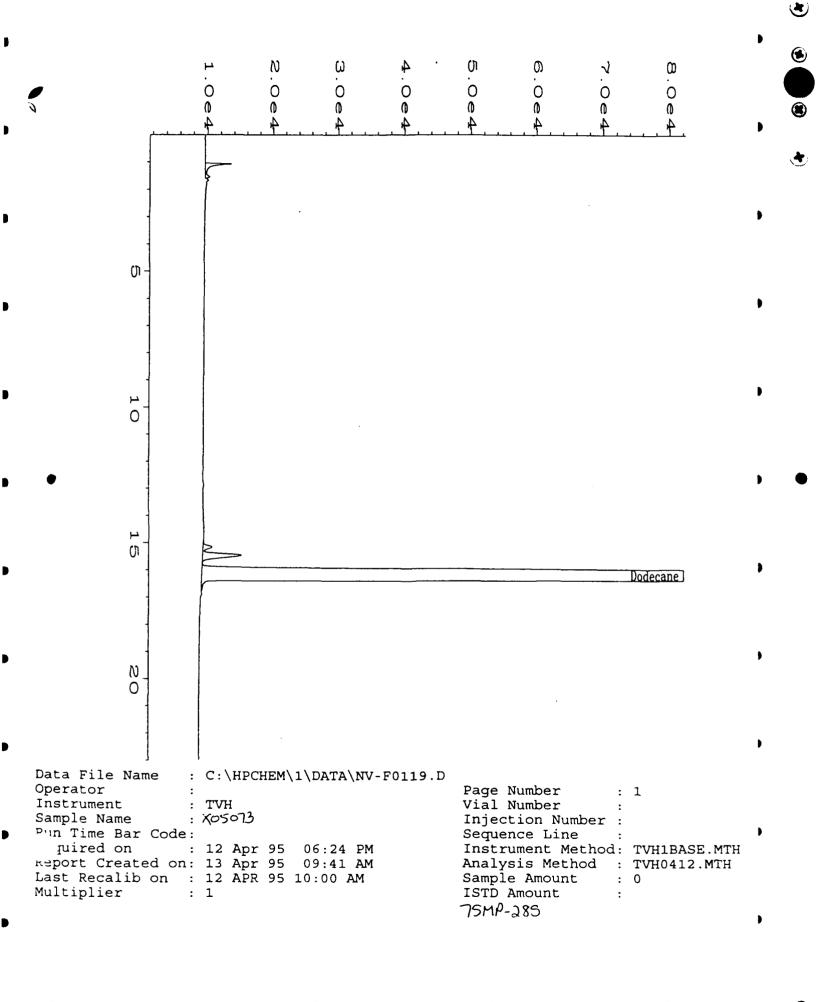
Data File Name : C:\HPCHEM\1\DATA\NV-F0117.D Operator Page Number Instrument : TVH Vial Number Injection Number: Sample Name Run Time Bar Code: Sequence Line puired on : 12 Apr 95 05:12 PM Instrument Method: TVH1BASE.MTH ...port Created on: 13 Apr 95 09:40 AM Analysis Method : TVH0412.MTH Sample Amount Last Recalib on : 12 APR 95 10:00 AM : 0 Multiplier ISTD Amount

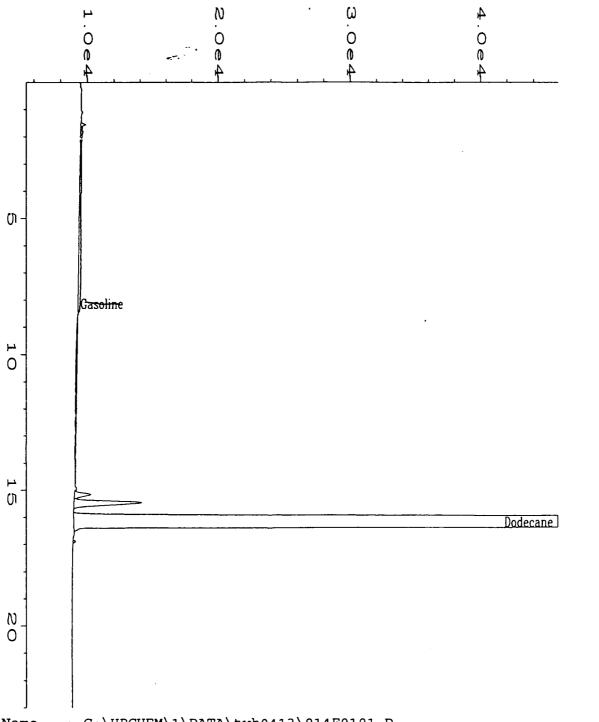


: C:\HPCHEM\1\DATA\NV-F0118.D Data File Name Page Number Operator Vial Number : TVH Instrument :05072 DUP Injection Number : Sample Name Sequence Line Run Time Bar Code: Instrument Method: TVH1BAS : 12 Apr 95 05:48 PM Acquired on Analysis Method : TVH0412.ml Report Created on: 13 Apr 95 09:41 AM Last Recalib on : 12 APR 95 10:00 AM Sample Amount : 0

ISTD Amount

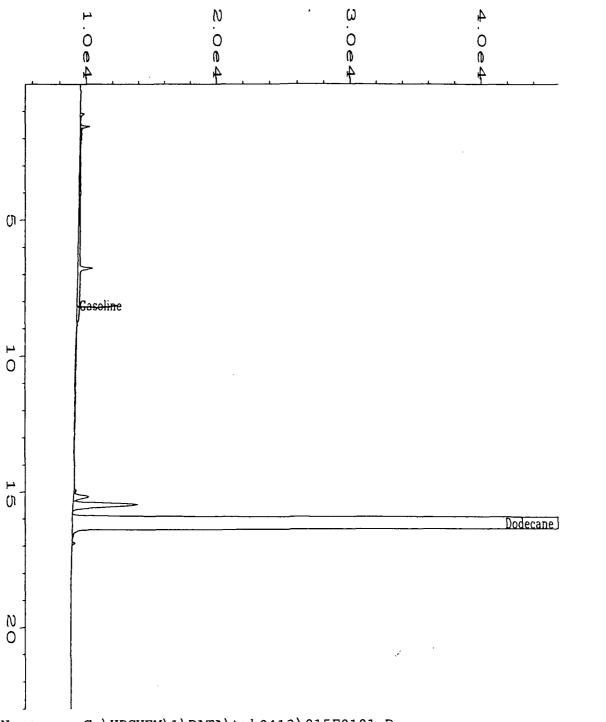
Multiplier : 1





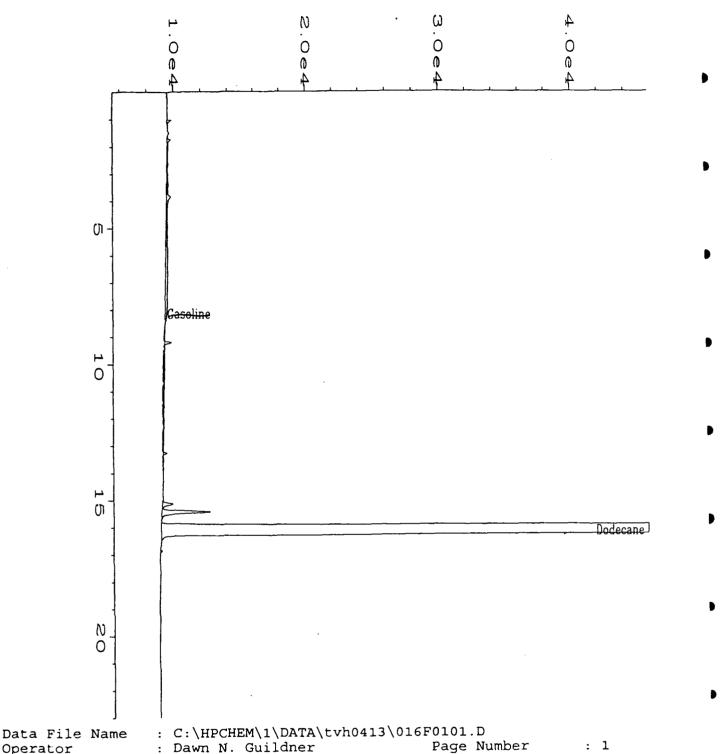
Data File Name : C:\HPCHEM\1\DATA\tvh0413\014F0101.D Operator : Dawn N. Guildner Page Number Instrument Vial Number : TVH : 14 Sample Name : X05078;1;5 Injection Number: 1 Run Time Bar Code: : 1 Sequence Line Acquired on : 13 Apr 95 06:00 PM Report Created on: 14 Apr 95 09:48 AM Instrument Method: TVH1BAS Analysis Method : TVH0413.MT Last Recalib on : 13 APR 95 02:21 PM Sample Amount Multiplier ISTD Amount : 1 Sample Info : PROJECT # 95-1044 CLIENT # 75MP-9D WATER

pm 4/21/95

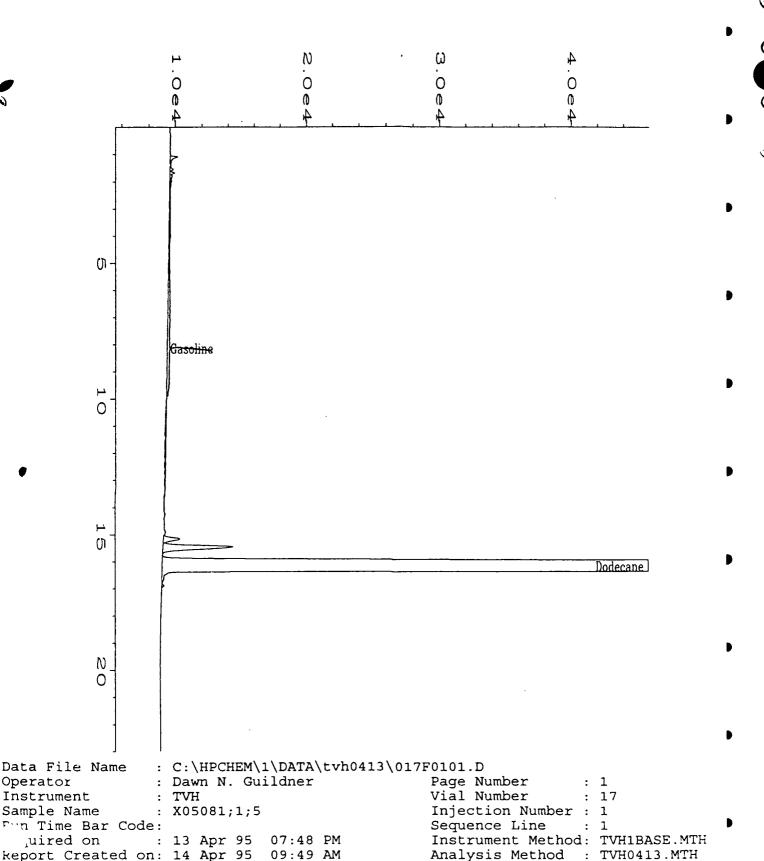


```
Data File Name
                : C:\HPCHEM\1\DATA\tvh0413\015F0101.D
                                                Page Number
Operator
                 : Dawn N. Guildner
Instrument
                                                Vial Number
                 : TVH
                                                Injection Number: 1
Sample Name
                 : X05079;1;5
Dun Time Bar Code:
                                                Sequence Line
  quired on
                : 13 Apr 95 06:36 PM
                                                Instrument Method: TVH1BASE.MTH
Report Created on: 14 Apr 95 09:48 AM
                                                Analysis Method : TVH0413.MTH
Last Recalib on : 13 APR 95 02:21 PM
                                                Sample Amount
                                                                 : 0
                                                ISTD Amount
Multiplier
                : PROJECT # 95-1044 CLIENT # 75MP-9S WATER
Sample Info
```

Du 4/21/95

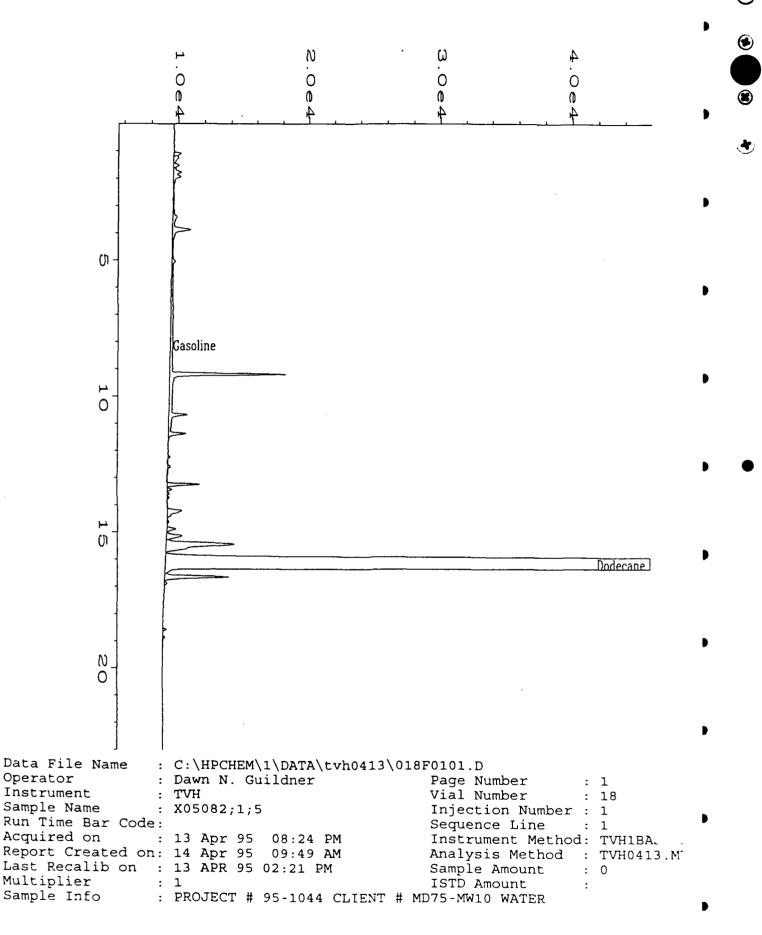


Operator Vial Number : 16 Instrument : TVH Injection Number: 1 Sample Name : X05080;1;5 Sequence Line : 1 Run Time Bar Code: Instrument Method: TVH1BAS. : 13 Apr 95 07:12 PM Acquired on Analysis Method : TVH0413.MT Report Created on: 14 Apr 95 09:48 AM Sample Amount : 0 Last Recalib on : 13 APR 95 02:21 PM ISTD Amount Multiplier : PROJECT # 95-1044 CLIENT # MD75-MW13 WATER Sample Info Dm 4/21/95



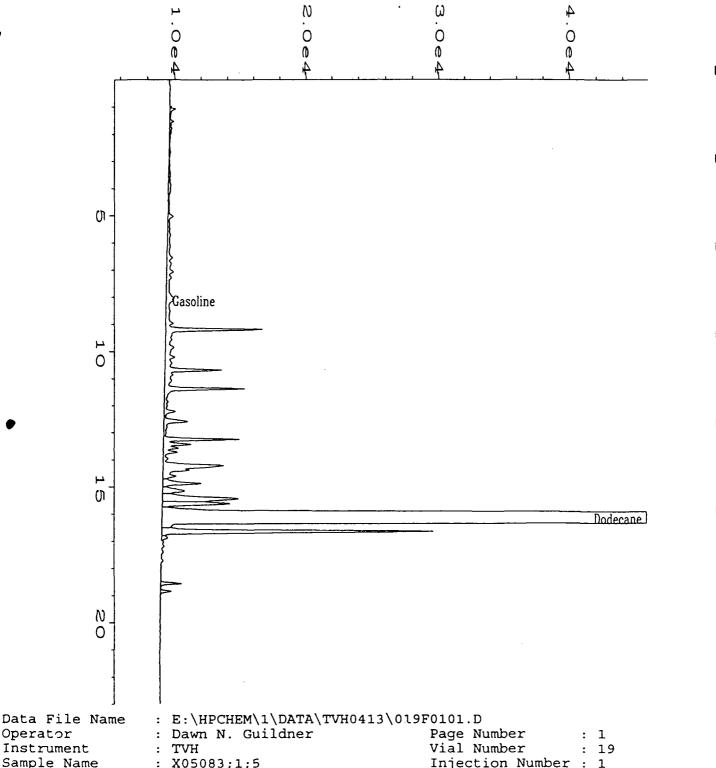
Last Recalib on : 13 APR 95 02:21 PM Sample Amount ISTD Amount Multiplier : PROJECT # 95-1044 CLIENT # MD75-MW11 WATER Sample Info

pm 4/21/95



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Operator : Dawn N. Guildner Page Number : 1
Instrument : TVH Vial Number : 19
Sample Name : X05083;1;5 Injection Number : 1
Pun Time Bar Code: Sequence Line : 1
Quired on : 13 Apr 95 09:00 PM Instrument Method: TVH1BASE.MTH
Report Created on: 17 Apr 95 09:50 AM Analysis Method : TVH0413.MTH
Last Recalib on : 13 APR 95 02:21 PM Sample Amount : 0
Multiplier : 1 ISTD Amount : MD75-MW9

_______ External Standard Report

Data File Name : C:\HPCHEM\1\DATA\BX10417\020F0101.D

Operator : C.J. Cook Page Number : 1 Vial Number : 20 Instrument : BTEX1 Injection Number : 1 Sample Name : X05083;10;0.500 Sequence Line : 1 Run Time Bar Code:

Instrument Method: BX10417B.M7 Acquired on : 17 Apr 95 07:18 PM Report Created on: 17 Apr 95 07:45 PM Analysis Method : BX10417B.MT

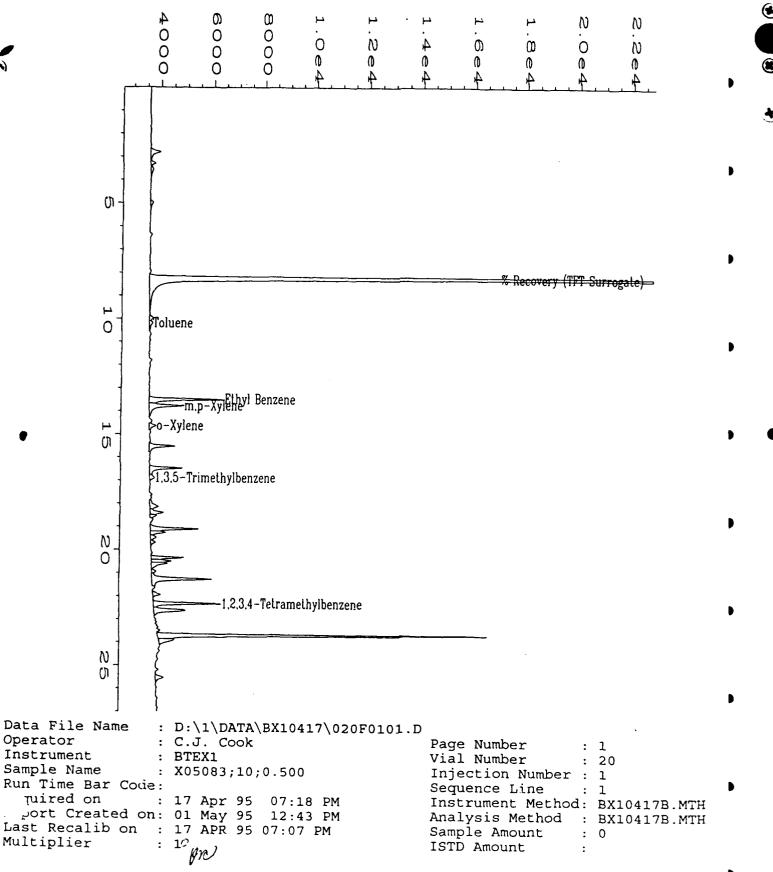
Last Recalib on : 10 APR 95 02:22 PM Sample Amount : 0 ISTD Amount Multiplier : 10

Sample Info : Project#: 95-1044 Client#: MD75-MW9

Sample Info	: Pr	oject#:	95-1044	Client#:	MD75-MW9 Water
Sig. 1 in C	:\HPCHEM\1	\DATA\BX	10417\02	0F0101.D	past holding
Ret Time	Area		dth Ref#	•	Name
				-	
6.390 *	not found	*	1		Benzene
8.234	233142	VV 0.	107 1-R	758.365	% Recovery (TFT Surrogate) 767
10.176	1840	VV 0.	184 1	2.160	Toluene
13.196 *	not found	*	1		Chlorobenzene
13.474	17563	VV 0.	093 1	24.449	Ethyl Benzene
13.753	10754	VV 0.	117 1	12.135	m,p-Xylene
14.619	2304	VV 0.	126 1	2.989	o-Xylene
16.869	1878	VV 0.	160 1	2.100	1,3,5-Trimethylbenzene
17.775 *	not found	*	1		1,2,4-Trimethylbenzene
18.722 *	not found	*	1		1,2,3-Trimethylbenzene
22.296	14570	PV 0.	088 1	29.889	1,2,3,4-Tetramethylbenzene

Expected RT Time Reference Peak Actual RT Difference 8.234 -0.041 2 8.275

Not all calibrated peaks were found



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External Standard Report						
	:=======:		=====			
Data File Name	: C:\HPCH	M\2\DAT	A\BX2	0413\038	R0201.D	
Operator	: SW Tysor		•	-	Page Number : 1	
Instrument	: BTEX2				Vial Number : 38	
Sample Name	: X05083;	.;5			Injection Number : 1	
Run Time Bar Cod	le:				Sequence Line : 2	
Acquired on	: 14 Apr 9	02:0	4 AM		Instrument Method: BX20413A.N	
Report Created o	-				Analysis Method : BX20413B.M	
Last Recalib on	: 14 APR 9	5 00:39	AM		Sample Amount : 0	
Multiplier	: 1				ISTD Amount :	
Sig. 2 in C:\HPC					PRO10	
Ret Time Are		Width R			. Name	
	•					
4.533	480 BB	0.089	1	0.380	Benzene C	
	39337 VV	0.092	1-R	89.767	TFT Surrogate (% REC.) = 90/	
7.601	1433 VV	0.126	1	1.272	Toluene = 1.3	
10.047					Chlorobenzene 0.5	
10.262	63371 VV	0.087	1	61.300	Ethyl Benzene -6/.)	

Time Reference Peak	Expected RT	Actual RT	Difference
2	6.002	5.980	-0.022

2.173 m,p-Xylene = 2, →

1,3,5-Trimethylbenzene

2.083 1,2,4-Trimethylbenzene = 2/

132.716 1,2,3,4-Tetramethylbenzene -/

2.687 1,2,3-Trimethylbenzene 2.

1.106 o-Xylene -/./

Not all calibrated peaks were found

2462 VV

1039 VV

1953 VV

2145 VV

99666 VV

0.124 1

0.089 1

0.096 1

0.086 1

1

0.129

10.524

11.217

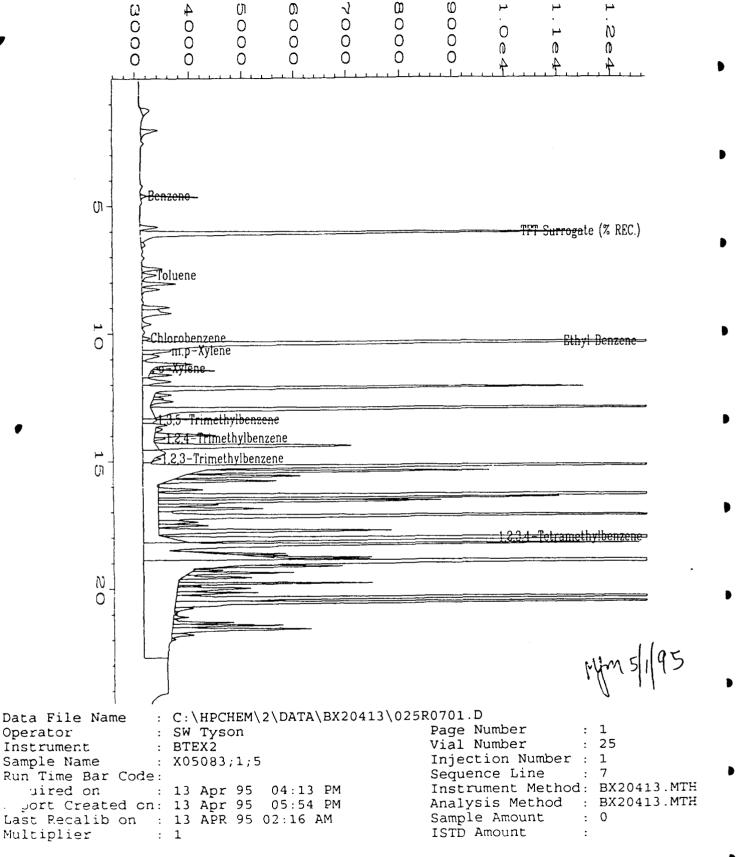
13.964

14.774

17.938

13.245 * not found *

the fine



MD75-MW9

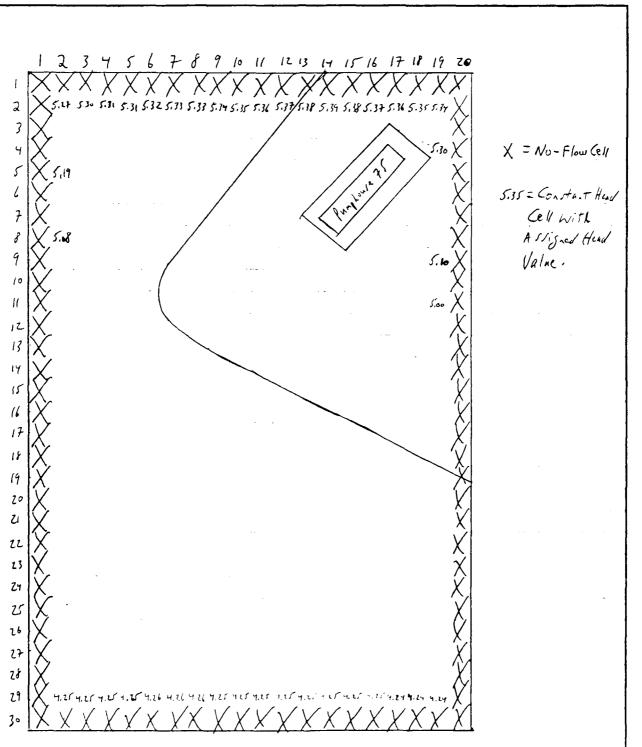
APPENDIX D

MODEL INPUT PARAMETERS, RELATED CALCULATIONS, AND BIOPLUME MODEL MASS BALANCE ERROR DISCUSSION

022/722450/203.WW5

ES ENGINEERING-SCIENCE, INC.

Client AFCEE MacDill AFB Subject Model grid with boundary Conditions	Job No. 722450, 21050 By TRH	Sheet of
)	Checked	Rev



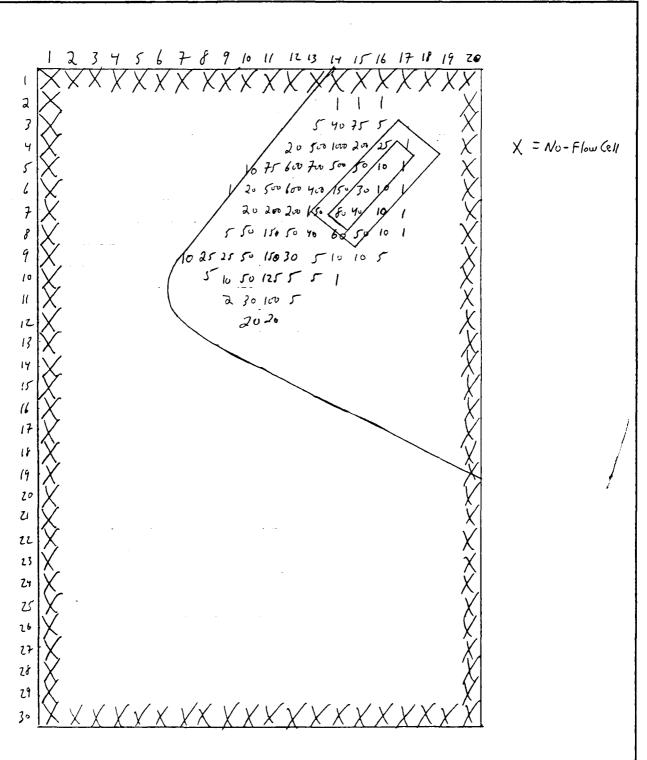
Client	AFCEE / MacDill AFB	Job No. 722750, 21050	Sheet of
● "ubject	Model and with Collibrated	By TCH	Date
,	Transmissinty Array	Checked	Rev

1234567891011 121314151617181920	
	7/
2 XCC000CCCCEEEEEAAX	Values in ft 2/sec
3 XCCCCCCCE/EEEEEAX	
4XCCCCCCAAA EEEEE E E KAX	X = No-Flow Cell
SXCCCCAANEERE/E/BX AX	
6 XCCCCCAAACOE/E/EXXAAX	A= 7.3x10-4-5.5x10-3
7 X CCCCCAAACD EED VAAAX	B = 5.5k10 - 1.1k10-2
8 X CCCCCCAODOODAAAAX	C= 11/x102-1.640-2
9 XCCCCCAODODOAAAAAX	D = 1.6 x 10-2-2.1x10-2
10 XCCCCCAAADDAAAAAAX	E= 2.1×10-2-2.7×10-2
11 XCCCCCCAAAOOAAAAAX	
12 XCCCCCAAAAAAAAAAX	•
13 X CCCCCAAAAAAAAAX	
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17 X B B B B B B B B B B B B B B B B B B	
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17 X C C C C C C B B B B B B B B B B B B B	
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3° X X X X X X X X X X X X X X X X X X X	

ES ENGINEERING-SCIENCE, INC. AFCEE / MacDill AFB 722450,21050 Job No. Model and with Recharge Rates TRH Date Ву Rev. Checked 234567891011 121314151617181920 X = No-Flow Cell Note: Rechage rates are Slow, in inche /yer; rate were entered into Themold As ft/second 19 U 22 23 24 25 26 27 28 29

ES ENGINEERING-SCIENCE, INC.

AFCEE MacDill AFB 722750,21050 Sheet ___ of ___ Job No. Model Endwith initial BTEX TRH Concentrations (11/94) (Mg/L) Checked Rev. -----

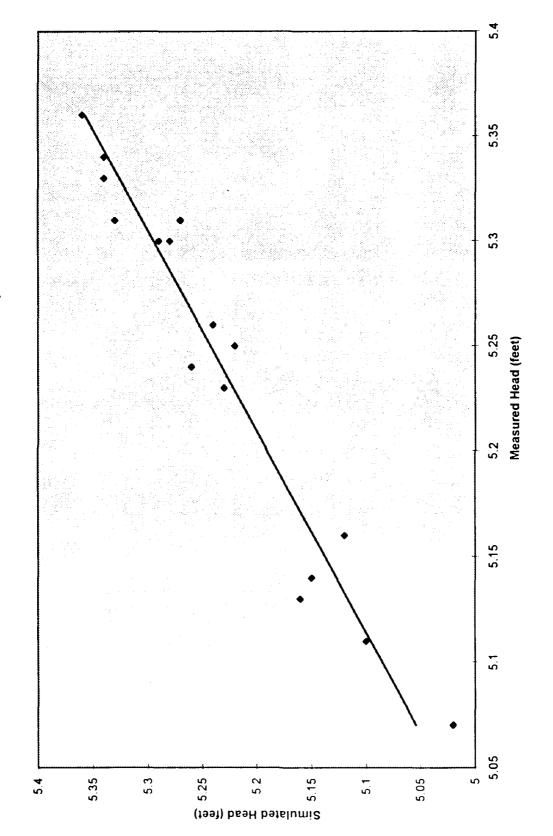


	666	· · · · · · · · · · · · · · · · · · ·		I lan a na consul	I laine date d	/LL LL-\40
v. 🖅 😁	OBS	X	Y		Hsimulated	(Hm-Hs) ²
V	1	12	8	5.26	5.24	0.0004
my pz	2	15	10	5.13	5.16	0.0009
wm. Qg	3	11	6	5.3	5.29	1E-04
EIWM	4	9	10	5.14	5.15	0.0001
mwol	5	18	7	5.24	5.26	0.0004
mwø3	6	9	7	5.25	5.22	0.0009
MP-IS	-	10	6	5.31	5.27	0.0016
MW15	8	12	4	5.31	5.33	0.0004
mwell	9	13	4	5.34	5.34	0
mwø6	10	16	3	5.36	5.36	0
MWSS	11	19	2	5.33	5.34	1E-04
pown	12	14	7	5.3	5.28	0.0004
MW12	13	11	8	5.23	5.23	0
MP-95	14	7	9	5.16	5.12	0.0016
MP-75	15	11	12	5.11	5.1	0.0001
1P-8S	16	8	12	5.07	5.02	0.0025
						0.0095
			RMS		% .	
			0.024367		2.1756237	

Rms = square root & average of square of differences

10 = Rms as a preentage of the head dray over the model domain.

Simulated vs. Measured Head, Calibrated Flow Model, Pumphouse 75, MacDill AFB



Page 1

Derivation of values used to compute decay rate constants:

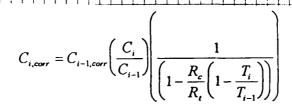
Dispersivity (α_x): The longitudinal dispersivity value of 40 feet used in the initial calibrated Bioplume II model was used. Use of a dispersivity equal to 25 feet (as used in the final calibrated model) reduces the computed decay rates by approximately 11 to 12 percent.

Contaminant Velocity (v_c): The average advective groundwater velocity of 0.06 ft/day computed in Section 3.5 was divided by the retardation coefficient used in the calibrated Bioplume II models (1.3) to compute the advective contaminant migration velocity of 0.05 ft/day.

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							MEDIATION				İ	
					M	ACDILL AI	B, FLORIDA	\			1	
										1	1	
						Distanc	e B, T, E	., & X (μg/L)			;	
				Po		Downgrad	ient l	Mar-95				
				MD75-		0		676]		
				MD75-		95	···· ·- ·- - - · ·	377				
			<u> </u>	MD75-		189	<u> </u>	121				
			1	75M	P-7S	314		18.7	<u> </u>		! .	
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-				PLOT	OF TO		E, & X CONC	ENTRATIO	V			
						VERSUS	DISTANCE					
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	_	100					•					-
	BTEX Concentration (ug/L)		i					_				
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	ratio					9.2e ^{-0.0116x}						· · · · — ·
	cen	10			R' =	0.9705			·			
	Con										-	
	ΕX											
	1 1 1 1											
	Total	1										
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• •		0.1										
**			5	0	100	150	200	250	300	350		
							vngradient (ft)					**
					i							
				1			• · ·			• • •		
				<u> </u>	i					1		
				İ			$\lambda = v_c/4\alpha_x([$	$1+2\alpha_x(k/v_x)]^2$	-1)	ĺ		
•					•					•		
•				•		where	$v_c = 0.05$		•	*	•	
•			•	•			$\alpha_x = 40$		•	••	•	
			•	•	•		$\alpha_{x} = \overline{40}$ $k/v = 0.0116$		•		•	
•			•	•					•	•		
			•	•		therefore	$\lambda = 8.49E-0$	A	•	•		

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1		FIRS	ST-ORDER	RATE CONSTA	NT CALCULA	ATION	, I		→ - · -
1				D OF BUSCHEO			5)	•	
			SI	TE 57 (PUMPHO	USE 75)				
			INTE	RINSIC REMED	IATION TS				
			M.	ACDILL AFB, F	LORIDA			1	
			-						
		ļ		Distance	B, T, E, & X (μg/L) ¦			
			Point	Downgradient	Nov-94				
		the second second second	75-MW04	0	976				
		A THE RESERVE OF THE PARTY OF T	75-MW08	95	541				
		MD	75-MW12	189	139				
						·· 		-	
		ļ							
		n.	OT OF TO		CONCENTE	ATION			
		PL	OI OF IO	TAL B, T, E, & X VERSUS DIST		ATION			
				VERSUS DIST	ANCE				
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		1							
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	Concentration (ug/L)		1	= 1110.6e ^{-0.0103x}		-			
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	intra	1	i_	R = 0.9493					
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				Distance Downgrad	ient (ft)				-
· †		· · · · · · · · · · · · · · · · · · ·							
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+				λ =	$v_c/4\alpha_x([1+2\alpha_x([$	$(v_1)^2 - 1$	- · •	- +	÷ ÷
;		· · · -				× (x) = (1)	•	· • =	
				where $v_c =$	0.05		•	•	
				$\alpha_{x} =$			•	•	
				α _χ =	0.0103		•		
			•	κ/v =	0.0103			•	
				. therefore $\lambda =$	7.27E-04	•			
L				alcrefore X =	1.4/104				

-			CHICALAIN CA . I DIO	allerates my
	 		Conservative Trues -	degradation Rater Wing Site 57, Mach. 11 AFB
	 		Author TRH	Sheet / Of /



where:

 $C_{i,cor}$ =corrected contaminant concentration at point i

 $C_{i-1,corr}$ =corrected contaminant concentration at point i-1. (If point i-1 is the first or most upgradient point, $C_{i-1,corr}$ is equivalent to the observed contaminant concentration.)

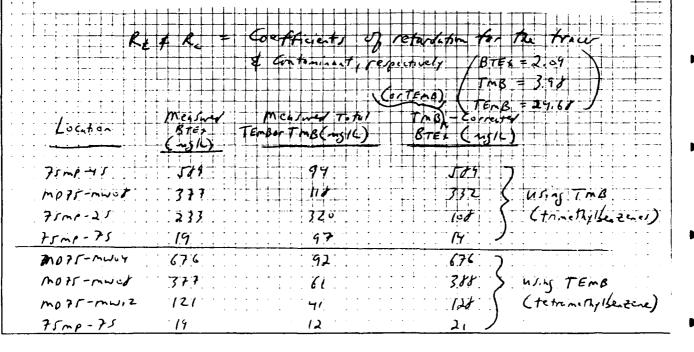
 C_i =observed contaminant concentration at point i

 C_{i-1} =observed contaminant concentration at point i-1

 T_i =observed tracer concentration at point i

 T_{i-1} =observed tracer concentration at point i-1

Note: This assumes that $R_i/R_c + T_i/T_{i-1} > 1$.

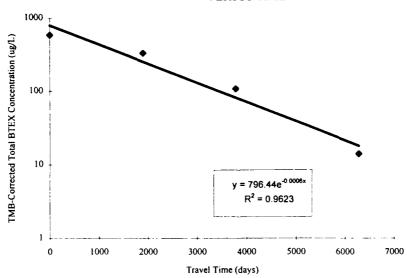


FIRST-ORDER RATE CONSTANT CALCULATION USING TMB AS A CONSERVATIVE TRACER SITE 57 (PUMPHOUSE 75) INTRINSIC REMEDIATION TS MACDILL AFB, FLORIDA

Point	Distance Downgradient	Travel Time Between Upgradient and Downgradient Point (days)	Measured Total BTEX Concentration	Total Trimethylbenzene Concentration	Trimethylbenzene- Corrected Total BTEX Concentration
75MP-4S	(ft) 0	(uays) 0	(μg/L) 589	(μg/L) 94	(μg/L) 589
MD75-MW08	95	1900	377	118	332
75MP-2S	189	3780	233	320	108
75MP-7S	314	6280	19	97	14

 $v_c = 0.05$ ft/day (average for all BTEX compounds)

PLOT OF TMB-CORRECTED TOTAL BTEX CONCENTRATION VERSUS TIME

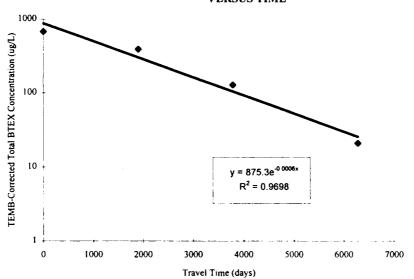


FIRST-ORDER RATE CONSTANT CALCULATION USING TETRAMETHYLBENZENE AS A CONSERVATIVE TRACER SITE 57 (PUMPHOUSE 75) INTRINSIC REMEDIATION TS MACDILL AFB, FLORIDA

D	Distance Downgradient	Travel Time Between Upgradient and Downgradient Point	Measured Total BTEX Concentration	Total Tetramethylbenzene Concentration	Tetramethylbenzene Corrected Total BTEX Concentration
Point MD75-MW04	(ft) 0	(days)	(μg/L) 676	(μg/L) 92	(μg/L) 676
MD75-MW08	95	1900	377	61	388
MD75-MW12	189	3780	121	41	128
75MP-7S	314	6280	19	12	21

 $v_c = 0.05$ ft/day (average for all BTEX compounds)

PLOT OF TEMB-CORRECTED TOTAL BTEX CONCENTRATION VERSUS TIME



11/20/96

CALCULATION OF RETARDATION COEFFICIENTS SITE 57 (PUMPHOUSE 75) INTRINSIC REMEDIATION TS MACDILL AIR FORCE BASE, FLORIDA

	Coefficient of	Retardation	Minimum Average	1.00 1.15	1.00 1.36	1.00 1.90	1.00 1.78	1.00	1.00 1.69	1.00 2.70	1.00 2.48	1.00 2.30	1.00 12.84
	Coel	Ret	Maximum M	1.30	1.73	2.80	2.56	2.62	2.37	4.39	3.96	3.60	24.68
		Effective	Porosity e'	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
	Bulk	Density	(kg/L) ^{d/}	1.60	1.60	1.60	1.60	1.60	1.60	1.60	()'1	1.60	1.60
	icient		Average ^{c3/}	0.024	0.057	0.140	0.122	0.127	0.107	0.265	0.232	0.203	1.850
	Distribution Coefficient	K _d (L/kg)	Minimum ^{c2}	0.000	0.000	0.000	0.000	0.000	0.000	0.000	000.0	0.000	0.000
	Distri		Maximum ^{c1/} Minimum ^{c2/} Average ^{c3/}	0.047	0.114	0.281	0.243	0.253	0.214	0.530	0.463	0.406	3.700
Average	Fraction	Organic	Carbon ^{b'}	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
Minimum	Fraction	Organic	Carbon	0	0	0	0	0	0	0	0	0	0
Maximum	Fraction	Organic	Carbon ^{bv}	9000.0	9000'0	9000.0	9000:0	9000.0	9000.0	9000.0	9000.0	9000.0	9000.0
		X,	(L/kg *)	6/	190	468	405	422	357	884	772	9/9	9919
			Compound	Benzene	Toluene	Ethylbenzene	m-xylene	o-xylene	p-xylene	1,2,3-TMB	1,2,4-TMB	1,3,5-TMB	1,2,4,5-TEN1

NOTES:

^a From technical protocol (Wiedemeier et al., 1995) and Montgomery (1996) (for TEMB).

^b From laboratory analyses of site soil samples

 $K_d = Maximum Fraction Organic Carbon x K_{oc}$

 c2 . $K_d = Minimum Fraction Organic Carbon x <math>K_{oc}$

 c3 K_d = Average Fraction Organic Carbon x K_{oc}

 $^{\mathrm{d}}$ From laboratory analyses of moisture content, and assumed porosity and specific gravity.

c Literature value.

DISCUSSION OF MASS BALANCE ERRORS, MODEL PH75A

Relatively substantial contaminant mass balance errors were obtained during the PH75A simulation. For example, the mass balance error after 5 years of simulation time was approximately 40 percent. Experimentation revealed that a primary cause of these errors appears to be the introduction of oxygen into the model domain via precipitation-induced recharge. The reason for this introduction having such a substantial effect on the mass balance is not known. In order to check the effects of this error on the accuracy of the predictions derived from the simulations, a second model which does not incorporate oxygen recharge was run. The anaerobic decay coefficient in this second model was increased from 0.0005 day¹ to 0.0008 day¹, which is the value obtained using the method of Buscheck and Alcantar (1995) (see Section 5.3.5). The decay coefficient was increased to balance the effects of deleting oxygen recharge from the model. The second model was identical to model PH75A in all other respects. The results of this model were very similar to those of PH75A, both in the temporal variation of maximum BTEX concentrations and in the magnitude of BTEX concentrations leaving the model domain. In addition, the contaminant mass balance error was substantially improved, equaling 0.2 percent after 5 years of simulation time. The results of this confirmation model indicate that the excessive mass balance errors obtained with model PH75A do not adversely affect the validity of the simulations.

APPENDIX E MODEL INPUT AND OUT TIT FILES

APPENDIX F REMEDIAL ALTERNATIVE COST CALCULATIONS

Alternative 1: Long-Term Monitoring and Institutional Controls

Standard Rate Schedule

YEARS 1 THROUGH 4

Standard Rate Schedule		TEARSTI	HROUGH 4				
Billing	Billing		Install New				
Category		Task 1	LTM/POC	1	Sampling		Reporting
Cost Code/(Billing Category)	Rate	(hrs)	Wells (\$)	(hrs)	(\$)	(hrs)	& PM (\$)
Word Processor 88/(15)	\$30	0	\$0	0	\$0	20	\$600
CADD Operator 58/(25)	\$47	0	\$0	0	\$0	20	\$940
Technician 42/(50)	\$40	5	\$200	34	\$1,360	30	\$1,200
Staff Level 16/(65)	\$57	45	\$2,565	34	\$1,938	60	\$3,420
Project Level 12/(70)	\$65	8	\$520	5	\$325	40	\$2,600
Senior Level 10/(80)	\$85	2	\$170	1	\$85	5	\$425
Principal 02/(85)	\$97	0	\$0	0	\$0	0	\$0
Total Labor (hrs \$)		60	\$3,455	74	\$3,708	175	\$9,185
ODCs							
Phone			\$20		\$10		\$40
Photocopy			\$10		\$5		\$100
Mail			\$100		\$200		\$50
Computer			\$100		\$0		\$400
CAD	'	Ì	\$0		\$0		\$200
WP			\$0		\$0		\$200
Travel	İ		\$200	ļ	\$200		\$0
Per Diem			\$100		\$200		\$0
Eqpt. & Supplies			\$700		\$1,000		\$0
Total ODCs			\$1,230		\$1,615		\$990
Outside Services							
LTM/POC Well Installation Cos	sts		\$12,750		\$0		\$ 0
Laboratory Fees			· ·	15 wells	\$3,000		so so
Other: Maintain Institutional Co	ontrols		\$0		\$0		\$5,000
Total Outside Services			\$12,750		\$3,000		\$5,000

Proposal Estimate	Task 1	Task 2	Task 3
Labor	\$3,455	\$3,708	\$9,185
ODC's	\$1,230	\$1,615	\$990
Outside Services	\$12,750	\$3,000	\$5,000
Total by Task	\$17,435	\$8,323	\$15,175
Total Labor	\$16,348		
Total ODCs	\$3,835		
Total Outside Services	\$20,750		
Total Project	\$40,933		

See attached sheet for well installation details.

Lab fees assume offsite analysis of 11 wells/yr for BTEX and methane. Analysis of 5 QC samples/yr for BTEX is also assumed

COSTS3 XLS LTM

10:31:96-E 01 PM

Alternative 1: Long-Term Monitoring and Institutional Controls

Standard Rate Schedule YEARS 5 THROUGH 18

Billing	Billing		Install New				
Category		Task 1	LTM/POC	Task 2	Sampling	Task 3	Reporting
Cost Code/(Billing Category)	Rate	(hrs)	Wells (\$)	(hrs)	(\$)	(hrs)	& PM (\$)
Word Processor 88/(15)	\$30	0	\$0	0	\$0	20	\$600
CADD Operator 58/(25)	\$47	0	\$0	0	\$0	20	\$940
Technician 42/(50)	\$40	0	\$0	40	\$1,600	30	\$1,200
Staff Level 16/(65)	\$57	0	\$0	40	\$2,280	60	\$3,420
Project Level 12/(70)	\$65	0	\$0	5	\$325	40	\$2,600
Senior Level 10/(80)	\$85	0	\$0	1	\$85	5	\$425
Principal 02/(85)	\$97	0	\$0	0	\$0	0	\$0
Total Labor (hrs \$)		0	\$0	86	\$4,290	175	\$9,185
ODCs							
Phone			\$0		\$10		\$40
Photocopy			\$0		\$5		\$100
Mail			\$0		\$200		\$50
Computer			\$0		\$0		\$400
CAD			\$0		\$0		\$200
WP			\$0		\$0		\$200
Travel			\$0		\$200	1	\$0
Per Diem			\$0		\$200		\$0
Eqpt. & Supplies		<u></u>	\$0		\$1,000		\$0
Total ODCs			\$0		\$1,615		\$990
Outside Services							
LTM/POC Well Installation Co	osts	1	\$0		\$0		\$0
Laboratory Fees			\$0	15 wells	\$4,000		\$0
Other: Maintain Institutional C	Controls		\$0		\$0		\$5,000
Total Outside Services			\$0		\$4,000		\$5,000

Proposal Estimate	Task 1	Task 2	Task 3
Labor	\$0	\$4,290	\$9,185
ODC's	\$0	\$1,615	\$990
Outside Services	\$0	\$4,000	\$5,000
Total by Task	\$0	\$9,905	\$15,175
Total Labor	\$13,475		
Total ODCs	\$2,605		
Total Outside Services	\$9,000		
Total Project	\$25,080		

Lab fees assume offsite analysis of 15 wells/yr for BTEX and methane. Analysis of 5 QC samples/yr for BTEX is also assumed.

COSTS XLS LEM 10/31/96\12-58 PM

MacDill AFB Calculations		: : : : : : : : : : : : : : : : : : :					
Alternatives 1 and 2: Long-term Monitoring							
	Cost calculations						
Mise calculations	Description	Unit	Qty.	Unit Price	Subtotal	Total	Total Source (If applicable)
Number of shallow LTM wells:	Well Installation					\$ 5,800	
Number of wells: 6	Mobilization	ea	-	\$ 1,000	\$ 1,000		
Depth each 12 ft	Well Installation	ln ft	72	\$ 50	\$ 3,600		
	Soil Disposal	drum	4	\$ 100	\$ 400		
	Soil Samples	ea	4	\$ 200	\$ 800		
Note: Soil samples analyzed for BTEX, TPH, reactivity	BTEX, TPH, reactivity, and corrosivity for disposal purposes.	posal pur	poses.				
Alternatives I and 2: Long-term Monitoring							
	Cost calculations						
Misc calculations	Description	Unit	Qty.	Unit Price	Subtotal	Total	Source (If applicable)
Number of deep LTM wells:	Well Installation					\$ 6,940	
Number of wells: 3	Mobilization	ea	_	\$ 1,000	\$ 1,000		
Depth each: 24 ft	Well Installation	In ft	72	0/ \$	\$ 5,040		
	Soil Disposal	drum	m	\$ 100	\$ 300		
	Soil Samples	ea	3	\$ 200	\$ 600		
Note: Soil samples analyzed for BTEX, TPH, reactivity	BTEX, TPH, reactivity, and corrosivity for disposal purposes.	posal pur	poses.				

(•

PARSON	ıs			Calculation Sheet
Rev By	Date	Ck SiC	Date 1/2/91	Alterative 1 Present Worth Costs
				Author TRH Sheet / Of /
				TAFINTUM FACTOR = 770 LTA year 1 74 = 57, 323 (attacked spreadsheet)
P.	rejent	Word Cowf	1 facto	(4411) = (1+0107) =11 = 3.39 (0.07) (1+447)
	(8)3	43)	(3.39) = \$28, RIS (Wells) 2014 for years 1 -> 4 = (\$9,905) (3.34) = \$33,578
				777, 1778 (15 wells, 47, ens)
	For	15	+ +	\$ 5,763 = difference Setween Hwetts \$ 15 wetts to dors for years 1-716 = (\$9,905) (10,06)
			PWF	$= f _{95,677}$ $= f _{95,677}$ $= f _{95,677}$ $= f _{95,677}$ $= f _{95,677}$ $= f _{95,677}$ $= f _{95,677}$
		4 9 9,	644 1000	- \$5,767 = \$94,201 = 50miting fort
Mainta		Trt	H	(1 Controls: PW= (10,06) (5,000) = 4.50,300
GW S	împt.	ัง	4 (13)	: PW = (17,475) (0,43) = \$16,215 : PW = \$94,281 : PW = (\$10,175) (10.06) = \$102,361
Reporti		m :		Total PW = \$263,157

Misc ODCI

Total \$64,350 round to \$654

650

200 22-141 22-142 22-144



Rev	Ву	Date	Ck	Date	Title	P : 10	
			1	12/97		Phyphone 75 11 Alternative 2 Pres	continued Corti
			 7	-		Marketine - Ilim	ann, with the state
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	(a	Ď	For	LTN	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	Stitutional Controlly	(12yews)
				PWF		(4+0.0 (a++)(7) -1 + 7,94 (40.07) 13 + 7,94
				ru =			9,905) = 5,267] +
					7	(1947) (# 15,1735)	12 11, 207
• • •		Tot	al P	WE	10	05,440 + \$211,20	57 = 4716,647
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Aftrans of Existing of Existing Bioventing Systems, Cost Per Sile Title 1 A Services (For Work Completed in 1994 - 1997)

20-Jul-94 c:\biovent\option1.wk4

	Hours	324.3	9	30 15 139.66		8 1,033.00		34 33	\$16.80	\$606.22 \$554.40
Labor Hours			9 9 9	07	2 8 00			76	10 013	\$41.75
	Task Description		Tack 1: Administration		Task 2 Extended Testing		Task 3: Letter Report Preparation		Total Labor Hours	Labor Hourly Rates (CY 1996)

1		
╗	51,652	F Profit on Item E at 11.99%
<u>:</u>	13,/81	E Total C and D
21:	00.971.66	D Other Direct Costs
1	CF.0C0,014	C Total Labor Cost
7-	730013	Including Fringe 139.61%
_	٠.٣٢٥,٢٤	B Home Office Overhead
5	00.171,150	A Direct Labor Cost
3	0 601 13	

Total Cost (AK/111/Johnston Atoll) Total Cost (CONUS)

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